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ABSTRACT

This revised version of "Mathematics for Horticulture" was developed to meet the needs of educators faced with teaching a mathematics curriculum based on real-life applications. The manual includes a wide range of topics, some remedial in nature, but all very basic to success in the industry. The manual contains seven chapters that cover the following topics: (1) measurement; (2) geometry for the landscape; (3) sales; (4) construction; (5) grass seed mixtures, sod, fertilizers, and chemicals; (6) using drawing scales and writing estimates for landscape plans; and (7) producing a crop for market. Each chapter includes information sheets, examples, and a variety of practice sets that can be used for student review or testing. Sample blank forms are included for writing sales receipts and for writing estimates for landscape projects. A separately bound answer key is included with the student manual. (KC)

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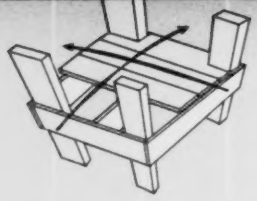

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Math for Horticulture

student manual

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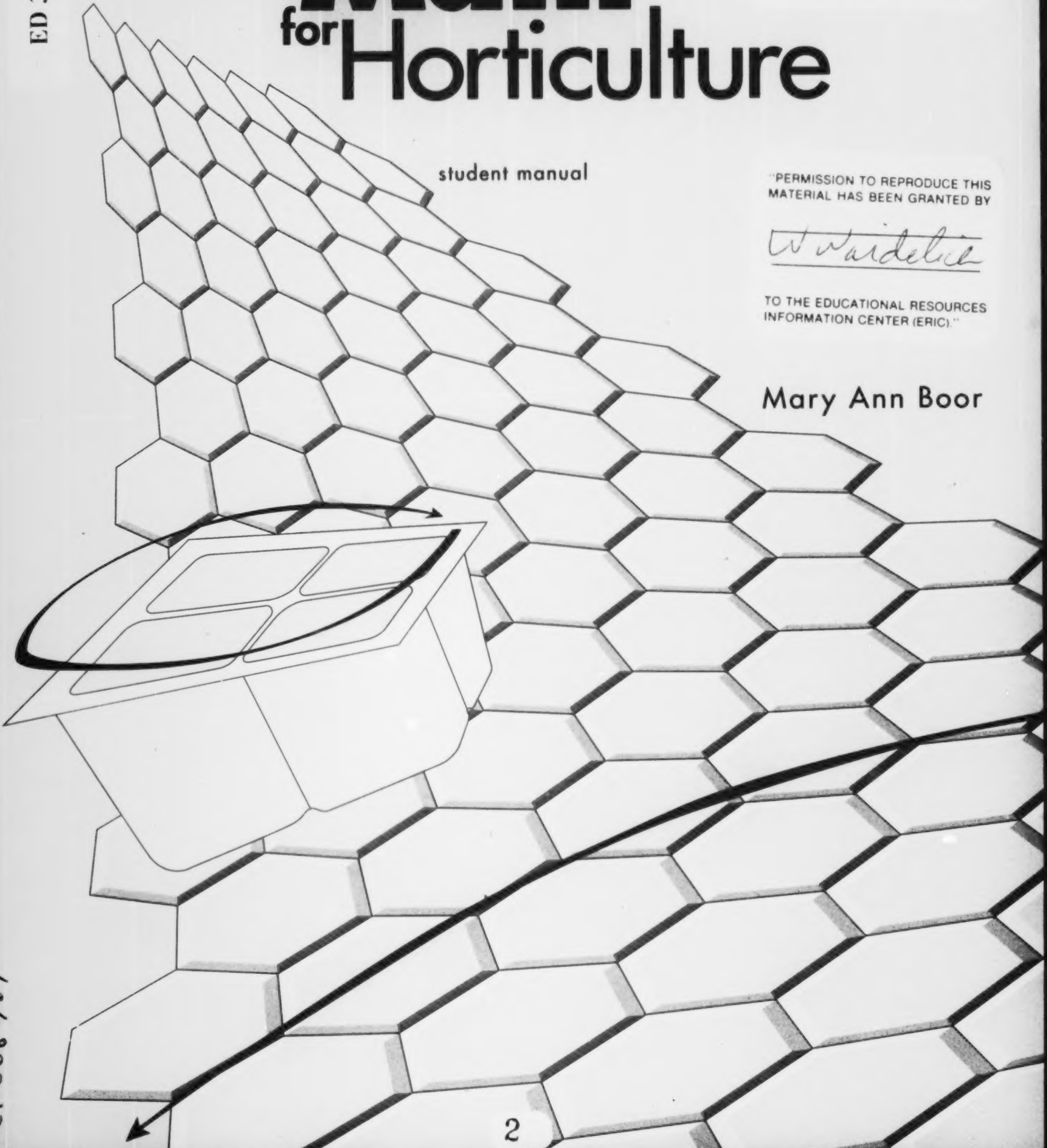

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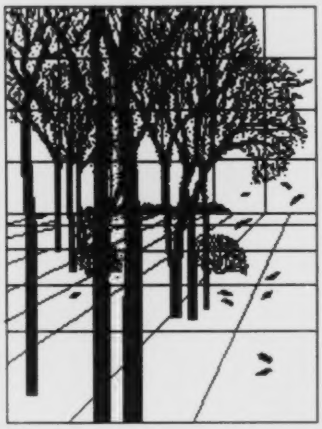

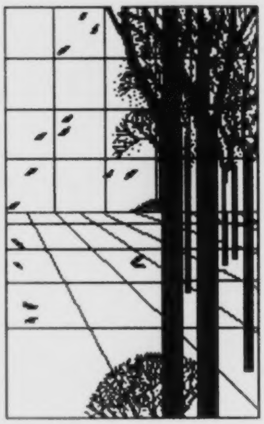

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PREFACE

As an educator, I have experienced the frustration of preparing to teach "applied math" when the curriculum has not yet been developed and no written materials are available. It is my hope that this student manual will help educators who are beginning their applied academic careers answer the question, "What am I going to do tomorrow?"

The modernization of vocational education in Ohio began with Amended Substitute Senate Bill 140. Applied academic curricula in English, mathematics, and science are an integral part of this modernization plan.

This revised version of *Mathematics for Horticulture* was developed to meet the needs of educators faced with teaching a mathematics curriculum based on real-life applications. The ability to use mathematics effectively may determine success or failure for a newcomer to the horticulture industry. Therefore, this manual includes a wide range of topics, some remedial in nature, but all very basic to success in the industry.

Each chapter in this manual includes at the end a variety of practice sets that can be used for student review or testing. A separate answer key is available for these practice sets. Because of this ***applied*** approach, the use of hand-held calculators is strongly recommended. Sample blank forms are included for writing sales receipts (page 90) and for writing estimates for landscape projects (pages 219-220). These may be reproduced for classroom use. A seed catalog is necessary for completion of some of the practice sets in Chapter 7; in fact, a classroom set would be very useful.

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– Mary Ann Boor

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CHAPTER 1

MEASUREMENT

By the time you finish this chapter, you will be able to

1) measure length and volume with the English measuring system.
2) convert a measurement from one unit to an equivalent one in the English system.
3) measure length and volume with the metric system.
4) convert a measurement from one unit to an equivalent one in the metric system.

* * * * * * * * * * * * * * *

Every person needs to use measurement tools correctly. People employed in the horticulture industry find this particularly important, whether they work in the field installing landscape designs or in a greenhouse planting beds of annuals. Questions such as *how much, how long, how heavy,* and many others can be answered only by using measurement.

There are two measurement systems used in the world today: the English system and the metric system. In the United States, the English system is in more popular use. However, since most of the rest of the world uses the metric system, we need to learn to use it, too, for our science and trade involvement with other countries.

The English System

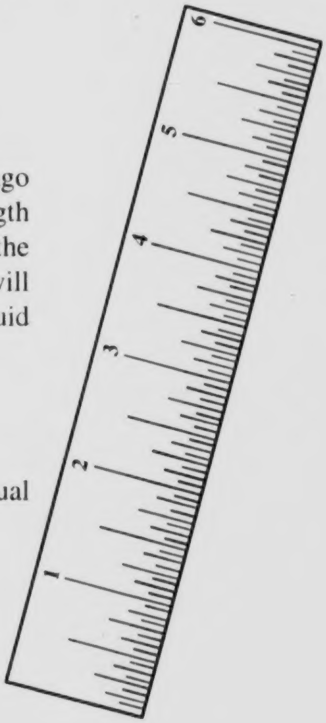
The English system was developed in England hundreds of years ago and was brought to our country by the colonists. The basic unit of length (linear measurement) is the yard; the basic unit of weight is the pound; and the basic unit of capacity (liquid measurement) is the gallon. In Chapter 1 we will compare linear measurement in both English and metric systems and liquid measurement in both English and metric systems.

Linear Measurement in the English System

A yard (**yd**) is subdivided into 3 equal units called feet (**ft**) or 36 equal units called inches (**in.**). Each foot is subdivided into 12 inches.

1 yard = 3 feet = 36 inches

1 foot = 12 inches



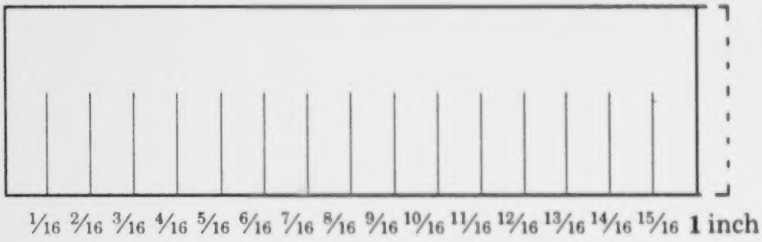

1/16 2/16 3/16 4/16 5/16 6/16 7/16 8/16 9/16 10/16 11/16 12/16 13/16 14/16 15/16 1 inch

Figure 1-1

An inch is further subdivided into 16 equal divisions, as Figure 1-1 shows in enlarged format. Each division is one 16th of an inch. Notice that some of these divisions of the inch are fractions that can be written in a simplified form as follows:

$$\frac{2}{16} = \frac{1}{8} \qquad \frac{4}{16} = \frac{1}{4} \qquad \frac{6}{16} = \frac{3}{8} \qquad \frac{8}{16} = \frac{1}{2}$$

$$\frac{10}{16} = \frac{5}{8} \qquad \frac{12}{16} = \frac{3}{4} \qquad \frac{14}{16} = \frac{7}{8} \qquad \frac{16}{16} = 1$$

Most people do not have difficulty reading the whole inches and half inches on an inch ruler. They do have problems locating 4ths, 8ths, and 16ths. To make it easier to read a ruler, the marks are given different lengths. The longest mark between the whole inch marks is the 1/2 inch mark; the next longest marks are the 1/4 inch and 3/4 inch marks, which are exactly halfway between the inch marks and the 1/2 inch marks (Figure 1-2).

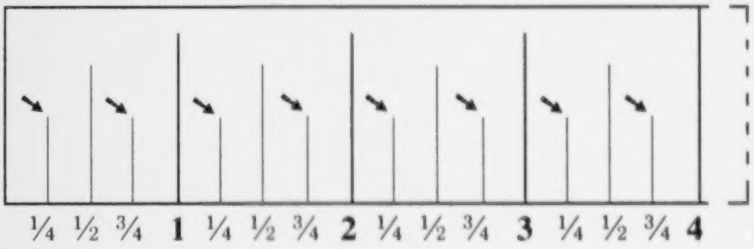


Figure 1-2

Read the length of segments **A** through **J** shown in Figure 1-3. This ruler is enlarged to help you.

The shortest marks on the inch ruler stand for 16ths. Remember that in Figure 1-1 every mark on the ruler is a 16th. To read 16ths, count the number of marks past the whole inch. For example, the segment in Figure 1-4 measures 1 5/16 inches because it extends 5 marks past the 1-inch mark.

Figure 1-5 shows that 8ths are located between the 16ths. Notice that some of the labels are fractions that could be written in simplified form (as shown on page 4).

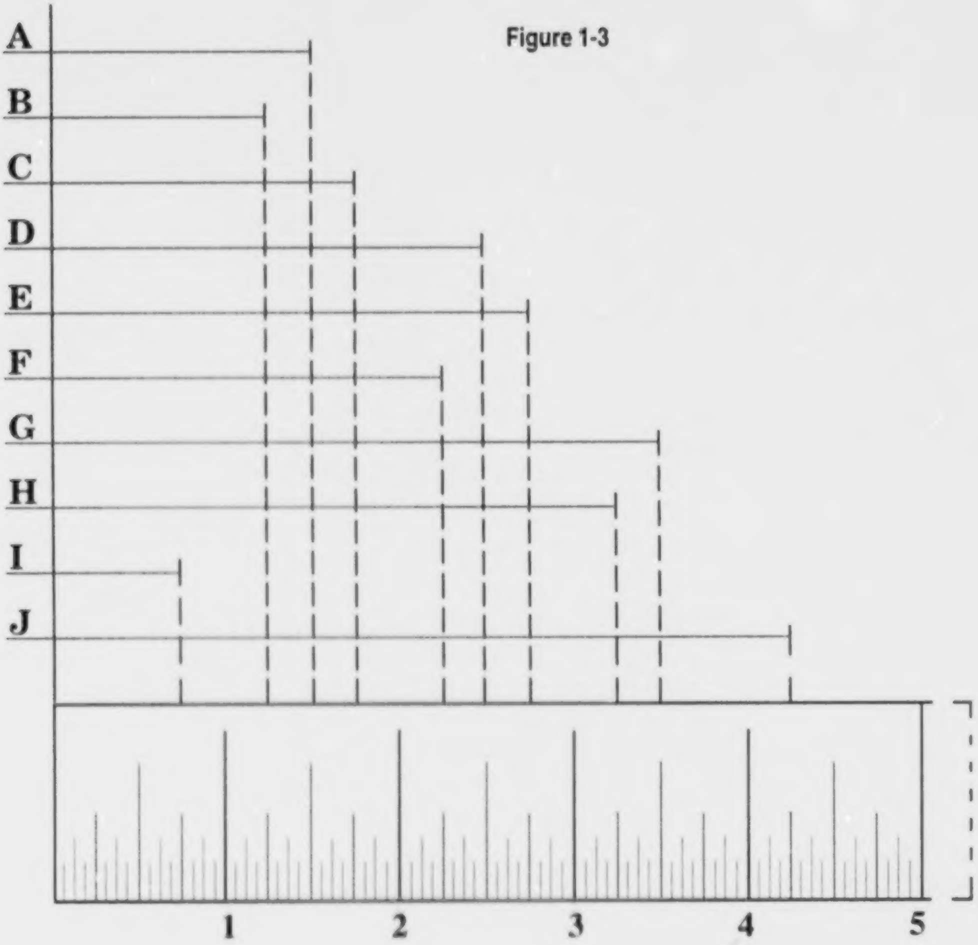


Figure 1-3

A
B
C
D
E
F
G
H
I
J
1
2
3
4
5

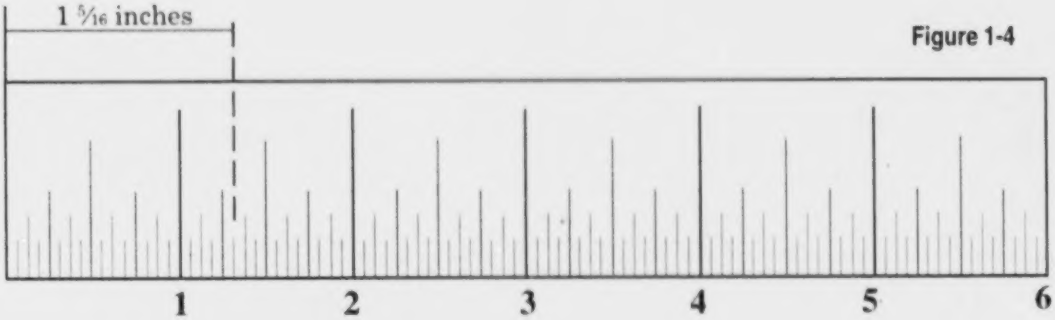


Figure 1-4

1 5⁄16 inches
1
2
3
4
5
6

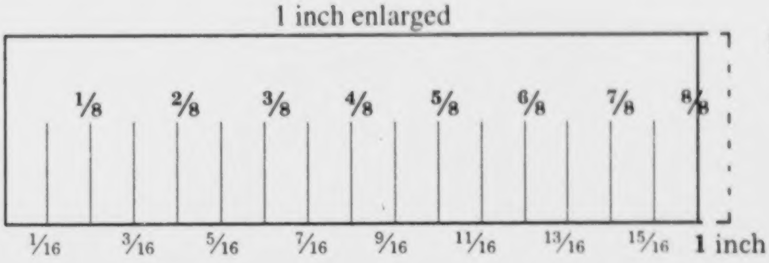


Figure 1-5

1 inch enlarged
1⁄8
2⁄8
3⁄8
4⁄8
5⁄8
6⁄8
7⁄8
8⁄8
1⁄16
3⁄16
5⁄16
7⁄16
9⁄16
11⁄16
13⁄16
15⁄16
1 inch

$$\frac{2}{8} = \frac{1}{4} \qquad \frac{4}{8} = \frac{1}{2} \qquad \frac{6}{8} = \frac{3}{4} \qquad \frac{8}{8} = 1$$

With these substitutions, the ruler now looks like the one in Figure 1-6.

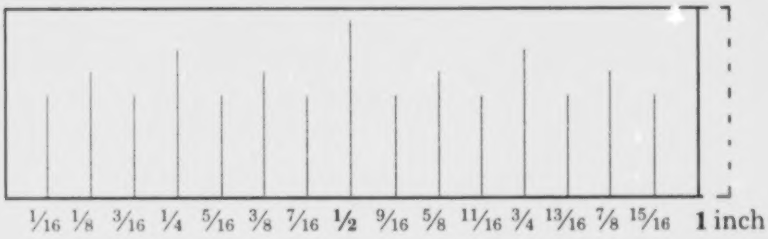


Figure 1-6

Horticulturists not only measure on the job, but often convert one unit of length to an equivalent one. For example, a watering hose for a greenhouse is 50 yards long. A bed in the greenhouse measures 100 feet in length. The worker in charge of watering wonders whether the hose will reach to the end of this bed. The worker could actually pull the hose to the end of the bed, but that would waste time. Instead, the worker should think, "50 yards equals how many feet?" Using a simple proportion, the worker can answer the question.

$$\frac{1 \text{ yard}}{3 \text{ feet}} = \frac{50 \text{ yards}}{?} \qquad \textit{(cancel common units)}$$

$$? = \frac{3 \text{ feet} \times 50 \text{ yards}}{1 \text{ yard}}$$

$$? = 150 \text{ feet}$$

The worker now knows that the hose is certainly long enough to water this bed.

A proportion is a number sentence that shows that comparisons, called ratios, are equal. In the example above, the comparison is yards to feet. This order exists on **both sides** of the equal sign. The proportion always has an order that **must** remain the same on both sides of the equal sign.

Now memorize these equivalents that you saw on page 1 so that you can convert one linear unit to another in the English system:

1 yard = 3 feet = 36 inches

1 foot = 12 inches

Use these equivalents in a proportion to make the following conversions.

Example 1

6 yards = __?__ feet

Think

$$\frac{1\text{ yard}}{3\text{ feet}} = \frac{6\text{ yards}}{?\text{ feet}}$$

(cancel common units)

$$? = \frac{3\text{ feet} \text{ x } 6\text{ yards}}{1\text{ yard}}$$

$$? = 18\text{ feet}$$

Example 2

6 yards = __?__ inches

Think

$$\frac{1\text{ yard}}{36\text{ inches}} = \frac{6\text{ yards}}{?\text{ inches}}$$

(cancel common units)

$$? = \frac{36\text{ inches} \text{ x } 6\text{ yards}}{1\text{ yard}}$$

$$? = 216\text{ inches}$$

Example 3

15 yards = __?__ feet

Think

$$\frac{1\text{ yard}}{3\text{ feet}} = \frac{15\text{ yards}}{?\text{ feet}}$$

(cancel common units)

$$? = \frac{3\text{ feet} \text{ x } 15\text{ yards}}{1\text{ yard}}$$

$$? = 45\text{ feet}$$

Example 4

15 yards = __?__ inches

Think

$$\frac{1\text{ yard}}{36\text{ inches}} = \frac{15\text{ yards}}{?\text{ inches}}$$

(cancel common units)

$$? = \frac{36\text{ inches} \text{ x } 15\text{ yards}}{1\text{ yard}}$$

$$? = 540\text{ inches}$$

Example 5

72 inches = __?__ yards

Think

$$\frac{1\text{ yard}}{36\text{ inches}} = \frac{?\text{ yards}}{72\text{ inches}}$$

(cancel common units)

$$? = \frac{\overset{2}{\cancel{72}}\text{ inches} \text{ x } 1\text{ yard}}{\underset{1}{\cancel{36}}\text{ inches}}$$

$$? = 2\text{ yards}$$

Example 6

72 inches = __?__ feet

Think

$$\frac{1\text{ foot}}{12\text{ inches}} = \frac{?\text{ feet}}{72\text{ inches}}$$

(cancel common units)

$$? = \frac{\overset{6}{\cancel{72}}\text{ inches} \text{ x } 1\text{ foot}}{\underset{1}{\cancel{12}}\text{ inches}}$$

$$? = 6\text{ feet}$$

Liquid Measurement in the English System

In the English measuring system, the basic unit for liquid measure *(how much)* is the gallon (**gal**) which is subdivided into 4 equal units called quarts (**qt**). Each quart is subdivided into 2 equal units called pints (**pt**), and each pint is subdivided into 16 equal units called ounces (**oz**).

1 gallon = 4 quarts = 8 pints = 128 ounces

1 quart = 2 pints = 32 ounces

1 pint = 16 ounces

Everyone who works in the horticulture business must know these liquid measurement equivalents. Imagine what would happen to the crop if a worker added 1 gallon of fertilizer to a 5-gallon tank of water when only 1 quart was supposed to be added! The crop would surely be burned and expensive chemicals wasted.

Proportions are also used to convert liquid measures to equivalent measures. For example, 3 gallons equals how many pints?

Example 1

3 gallons = __?__ pints

Think

$$\frac{1\text{ gallon}}{8\text{ pints}} = \frac{3\text{ gallons}}{?\text{ pints}}$$

(cancel common units)

$$? = \frac{8\text{ pints x }3\ \cancel{\text{gallons}}}{1\ \cancel{\text{gallon}}}$$

$$? = 24\text{ pints}$$

Example 2

48 ounces = __?__ pints

Think

$$\frac{1\text{ pint}}{16\text{ ounces}} = \frac{?\text{ pints}}{48\text{ ounces}}$$

(cancel common units)

$$? = \frac{1\text{ pint x }\overset{3}{\cancel{48}}\ \cancel{\text{ounces}}}{\underset{1}{\cancel{16}}\ \cancel{\text{ounces}}}$$

$$? = 3\text{ pints}$$

The Metric System

The metric system is the accepted measurement system used in most countries of the world. It is a system based on multiples of 10. The metric system was developed in France around 1790 and has been revised several times. Its official name today is the International System of Units or **SI**.

The meter is the basic unit of length; the gram is the basic unit of weight; and the liter is the basic unit of liquid capacity.

Unlike the English system, the metric system uses the same prefixes for all units of measure within the system. Once you have learned what each prefix means when measuring length, for example, you will know what it means for all other areas of measure - weight and liquid capacity. Some of the prefixes are:

kilo (**k**) means 1000 times
hecto (**h**) means 100 times
deka (**da**) means 10 times
deci (**d**) means .1 or one tenth of
centi (**c**) means .01 or one hundredth of
milli (**m**) means .001 or one thousandth of

Linear Measurement in the Metric System

The meter (**m**) is similar to but longer than the English yard. The meter is divided into 10 equal subunits called decimeters (**dm**). Each decimeter is subdivided into 10 equal units called centimeters (**cm**), and each centimeter is divided into 10 equal units called millimeters (**mm**).

1 meter = 10 decimeters = 100 centimeters = 1000 millimeters

1 decimeter = 10 centimeters = 100 millimeters

1 centimeter = 10 millimeters

Figure 1-7 shows an enlarged diagram of 1 decimeter. Notice that it is subdivided into 10 centimeters. Also notice that each centimeter is subdivided into 10 millimeters. It takes 10 decimeters to make one meter.

Figure 1-7 One decimeter, enlarged

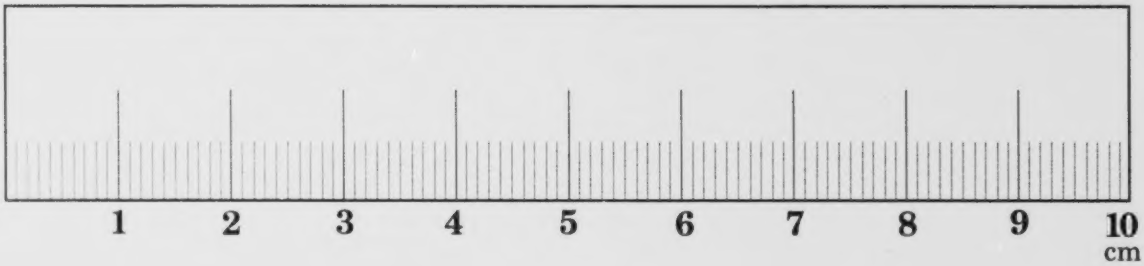


Figure 1-8 A metric ruler

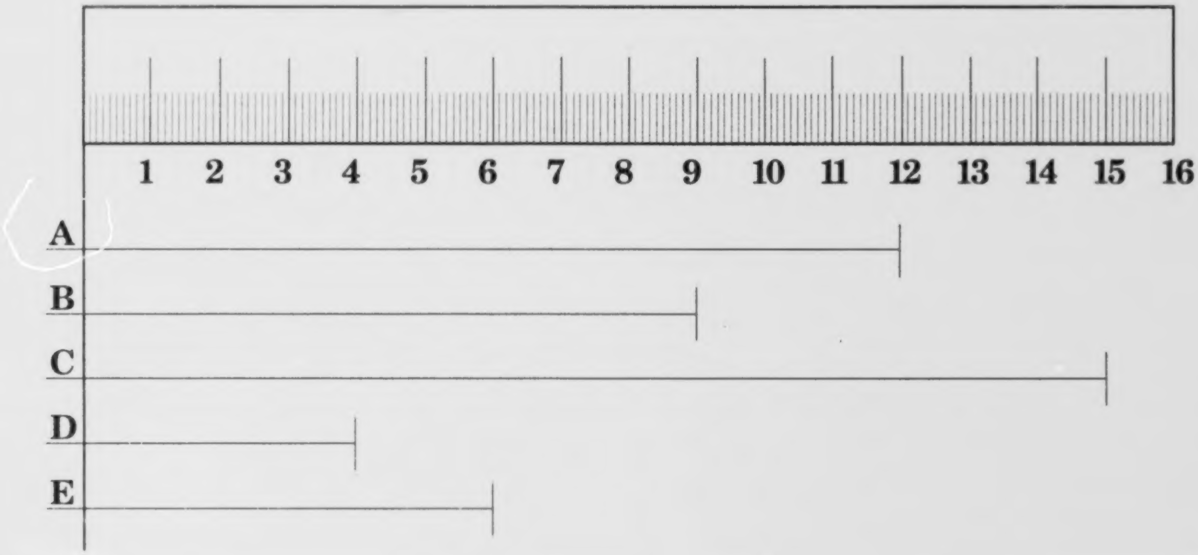


Figure 1-8 shows a metric ruler in actual size. Use it to measure in centimeters each of the line segments below it.

Often you will need to convert a linear metric measure to an equivalent one. Again, proportions can be used to complete the conversions. For example, what is the length of line A in millimeters? You found that it measures 12 centimeters.

Convert the measure of line A to millimeters.

$$\text{line } \mathbf{A} = 12 \text{ cm} = \underline{\ ?\ } \text{ mm}$$

$$\textit{Think} \quad \frac{1 \text{ cm}}{10 \text{ mm}} = \frac{12 \text{ cm}}{? \text{ mm}}$$

(cancel common units)

$$? = \frac{10 \text{ mm} \times 12 \text{ cm}}{1 \text{ cm}}$$

$$? = 120 \text{ mm}$$

Convert the measure of lines B, C, D, and E to millimeters.

line **B** = 9 cm = __?__ mm

Think

$$\frac{1\text{ cm}}{10\text{ mm}} = \frac{9\text{ cm}}{?\text{ mm}}$$

(cancel common units)

$$? = \frac{10\text{ mm} \times 9\text{ cm}}{1\text{ cm}}$$

$$? = 90\text{ mm}$$

line **C** = 15 cm = __?__ mm

Think

$$\frac{1\text{ cm}}{10\text{ mm}} = \frac{15\text{ cm}}{?\text{ mm}}$$

(cancel common units)

$$? = \frac{10\text{ mm} \times 15\text{ cm}}{1\text{ cm}}$$

$$? = 150\text{ mm}$$

line **D** = 4 cm = __?__ mm

Think

$$\frac{1\text{ cm}}{10\text{ mm}} = \frac{4\text{ cm}}{?\text{ mm}}$$

(cancel common units)

$$? = \frac{10\text{ mm} \times 4\text{ cm}}{1\text{ cm}}$$

$$? = 40\text{ mm}$$

line **E** = 6 cm = __?__ mm

Think

$$\frac{1\text{ cm}}{10\text{ mm}} = \frac{6\text{ cm}}{?\text{ mm}}$$

(cancel common units)

$$? = \frac{10\text{ mm} \times 6\text{ cm}}{1\text{ cm}}$$

$$? = 60\text{ mm}$$

Conversion to any of the other linear metric units can be made using proportions. You need to know only these basic facts, also given on page 7.

1 meter = 10 decimeters = 100 centimeters = 1000 millimeters

1 decimeter = 10 centimeters = 100 millimeters

1 centimeter = 10 millimeters

Here are a number of conversion examples.

Example 1

5 m = __?__ cm

Think

$$\frac{1\text{ m}}{100\text{ cm}} = \frac{5\text{ m}}{?\text{ cm}}$$

(cancel common units)

$$? = \frac{100\text{ cm} \times 5\text{ m}}{1\text{ m}}$$

$$? = 500\text{ cm}$$

Example 2

250 mm = __?__ dm

Think

$$\frac{1\ \text{dm}}{100\ \text{mm}} = \frac{?\ \text{dm}}{250\ \text{mm}}$$

(cancel common units)

$$? = \frac{1\ \text{dm} \times \overset{5}{\cancel{250}}\ \text{mm}}{\underset{2}{\cancel{100}}\ \text{mm}}$$

$$? = 2.5\ \text{dm}$$

Example 3

220 cm = __?__ m

Think

$$\frac{1\ \text{m}}{100\ \text{cm}} = \frac{?\ \text{m}}{220\ \text{cm}}$$

(cancel common units)

$$? = \frac{1\ \text{m} \times \overset{11}{\cancel{220}}\ \text{cm}}{\underset{5}{\cancel{100}}\ \text{cm}}$$

$$? = 2.2\ \text{m}$$

Liquid Measurement in the Metric System

A liter (**l**), which is slightly larger than a quart, is used to measure liquid in the metric system. Like the meter, a liter is divided into 10 equal units called deciliters (**dl**). Each deciliter is divided into 10 equal units called centiliters (**cl**), and each centiliter is divided into 10 equal units called milliliters (**ml**).

1 liter = 10 deciliters = 100 centiliters = 1000 milliliters

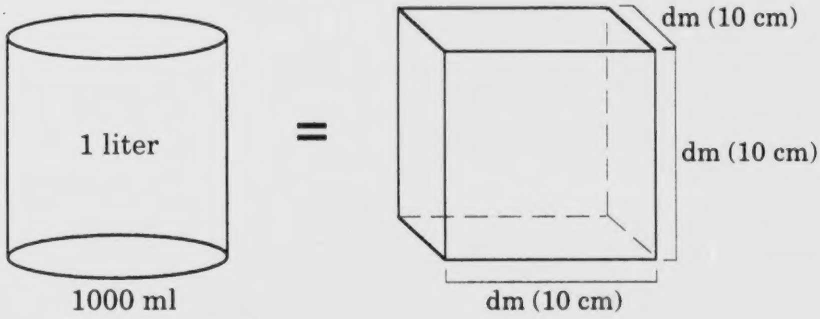
1 deciliter = 10 centiliters = 100 milliliters

1 centiliter = 10 milliliters

The liter or parts of a liter tell *how much* liquid a container holds. The liter and its parts express the volume of the container. It has been shown that a liter holds the same amount as a cubic decimeter (Figure 1-9).

1 liter = 1 cubic decimeter

Figure 1-9



$$\begin{aligned} 1000\ \text{ml} &= (10\ \text{cm})^3 \\ &= 1000\ \text{cu cm} \end{aligned}$$

By conversion -

$$\frac{1000 \text{ ml}}{1000} = \frac{1000 \text{ cu cm}}{1000}$$

1 ml = 1 cu cm (or cc)

As with converting from one linear unit to another in the metric system, you can convert from one liquid unit to an equivalent one with the use of proportions. For example, try converting 2.5 liters to deciliters.

Example 1

2.5 liters = __?__ dl

Think

$$\frac{1 \text{ liter}}{10 \text{ dl}} = \frac{2.5 \text{ liters}}{? \text{ dl}}$$

(cancel common units)

$$? = \frac{10 \text{ dl} \times 2.5 \text{ liters}}{1 \text{ liter}}$$

$$? = 25 \text{ dl}$$

Example 2

50 ml = __?__ liters

Think

$$\frac{1 \text{ liter}}{1000 \text{ ml}} = \frac{? \text{ liters}}{50 \text{ ml}}$$

(cancel common units)

$$? = \frac{1 \text{ liter} \times \overset{1}{\cancel{50}} \text{ ml}}{\underset{20}{\cancel{1000}} \text{ ml}}$$

$$? = 0.05 \text{ liter}$$

Example 3

65 cl = __?__ cu cm

Think

$$\frac{1 \text{ cl}}{100 \text{ ml}} = \frac{65 \text{ cl}}{? \text{ cu cm}}$$

(cancel common units)

$$? = \frac{100 \text{ ml} \times 65 \text{ cl}}{1 \text{ cl}}$$

$$? = 6500 \text{ ml}$$

Because 1 ml equals 1 cu cm, 6500 ml equals 6500 cu cm.

$$? = 6500 \text{ cu cm (cc)}$$

Example 4

10 dl = __?__ ml

Think

$$\frac{1 \text{ dl}}{100 \text{ ml}} = \frac{10 \text{ dl}}{? \text{ ml}}$$

(cancel common units)

$$? = \frac{100 \text{ ml} \times 10 \text{ dl}}{1 \text{ dl}}$$

$$? = 1000 \text{ ml}$$

Chapter 1, Practice Set 1

A. Draw a line segment of the correct length to the right of each measurement given.

1) 5 ½ inches

2) 1 ½ inches

3) 4 ½ inches

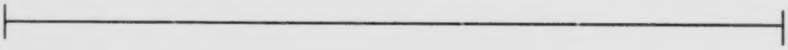
4) ½ inch

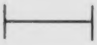
5) 4 inches

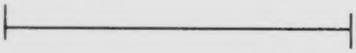
6) 3 inches

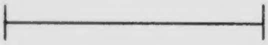
7) 3 ½ inches

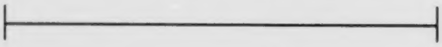
B. Measure each of the following line segments and write its length in inches in the space at the right.

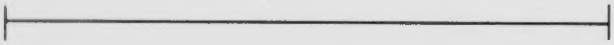
8)  ________

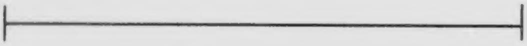
9)  ________

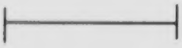
10)  ________

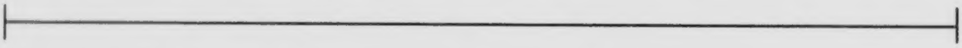
11)  ________

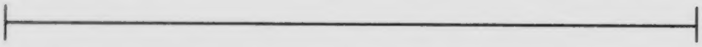
12)  ________

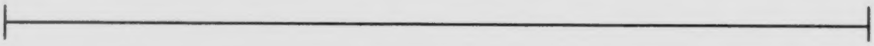
13)  ________

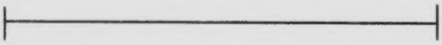
14)  ________

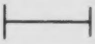
15)  ________

16)  ________

17)  ________

18)  ________

19)  ________

20)  ________

Chapter 1, Practice Set 2

A. Draw a line segment of the correct length to the right of each measurement given.

1) 2 ½ inches

2) 5 ¼ inches

3) 5 ¾ inches

4) 4 ½ inches

5) 2 ¾ inches

6) 4 ¼ inches

7) 3 inches

8) 4 ¾ inches

9) 5 ½ inches

10) 3 ¼ inches

11) ¾ inch

12) ½ inch

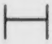
13) 2 ¼ inches

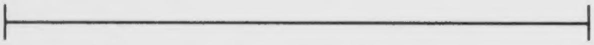
14) 3 ¾ inches

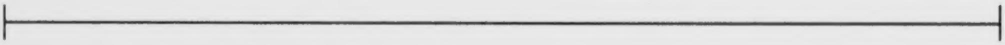
15) 4 inches

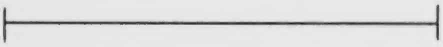
16) 6 ½ inches

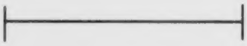
B. Measure each of the following line segments and write its length in inches in the space at the right.

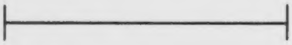
17)  ______

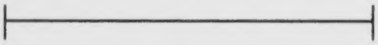
18)  ______

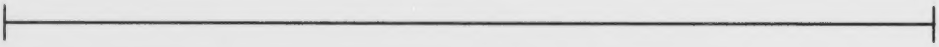
19)  ______

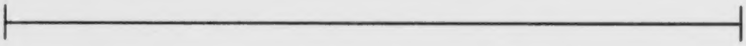
20)  ______

21)  ______

22)  ______

23)  ______

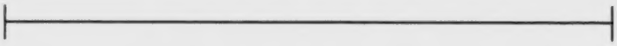
24)  ______

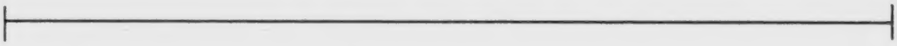
25)  ______

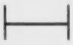
(continued)

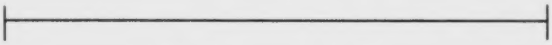
Chapter 1, Practice Set 2 *(page two)*

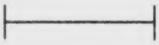
B. Measure each of the following line segments. *(continued)*

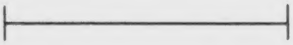
26)  ______

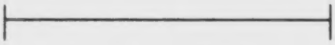
27)  ______

28)  ______

29)  ______

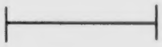
30)  ______

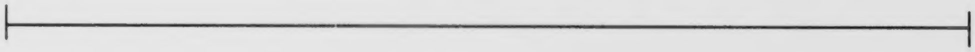
31)  ______

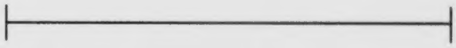
32)  ______

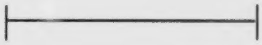
Chapter 1, Practice Set 3

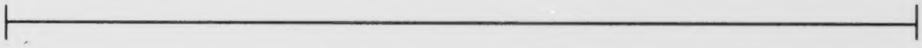
A. Measure each of the following line segments and write its length in inches at the space at the right.

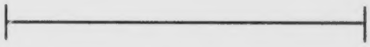
1)  ______

2)  ______

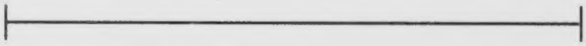
3)  ______

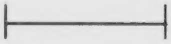
4)  ______

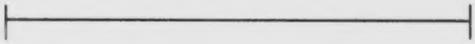
5)  ______

6)  ______

7) ______

8)  ______

9)  ______

10)  ______

B. Draw a line segment of the correct length to the right of each measurement given.

11) 4 inches

12) 5 3/16 inches

13) 4 7/8 inches

14) 1 1/4 inches

15) 15/16 inch

16) 5 11/16 inches

17) 3 1/16 inches

18) 2 5/8 inches

19) 4 13/16 inches

20) 2 7/16 inches

21) 2 5/16 inches

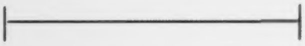
22) 4 3/4 inches

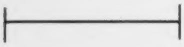
23) 1 9/16 inches

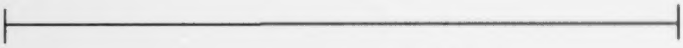
24) 3 1/2 inches

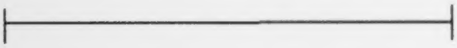
Chapter 1, Practice Set 4

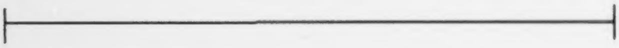
A. Measure each of the following line segments and write its length in inches in the space at the right.

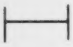
1)  ________

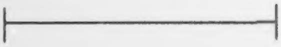
2)  ________

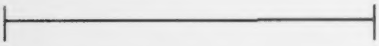
3)  ________

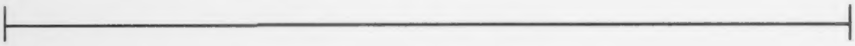
4)  ________

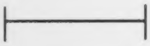
5)  ________

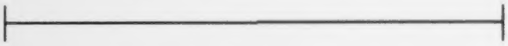
6)  ________

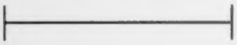
7)  ________

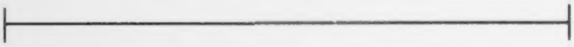
8)  ________

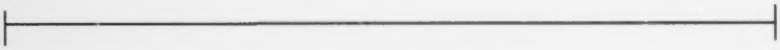
9)  ________

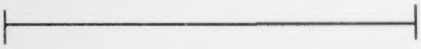
10)  ________

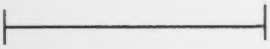
11)  ________

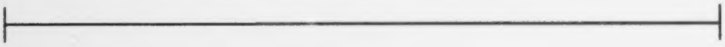
12)  ________

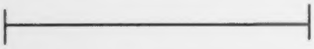
13)  ________

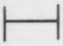
14)  ________

15)  ________

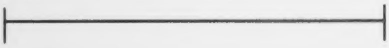
16)  ________

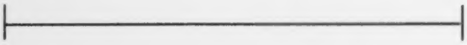
17)  ________

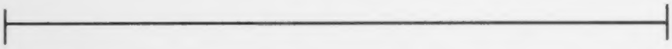
18)  ________

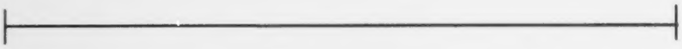
19)  ________

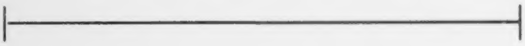
20) ________

21)  ________

22)  ________

23)  ________

24)  ________

25)  ________

Chapter 1, Practice Set 5

Fill in the blanks.

1. 5 yd = ______ ft
2. 7 yd = ______ ft
3. 13 yd = ______ ft
4. 10 yd = ______ ft
5. 72 yd = ______ ft
6. 8 yd = ______ ft
7. 12 yd = ______ ft
8. 15 yd = ______ ft
9. 23 yd = ______ ft
10. 18 yd = ______ ft
11. 5 yd = ______ in.
12. 7 yd = ______ in.
13. 13 yd = ______ in.
14. 10 yd = ______ in.
15. 27 yd = ______ in.
16. 8 yd = ______ in.
17. 12 yd = ______ in.
18. 15 yd = ______ in.
19. 23 yd = ______ in.
20. 18 yd = ______ in.
21. 6 ft = ______ in.
22. 8 ft = ______ in.
23. 5 ft = ______ in.
24. 10 ft = ______ in.
25. 6.5 ft = ______ in.
26. 12 ft = ______ in.
27. 2 ft = ______ in.
28. 7 ft = ______ in.
29. 9 ft = ______ in.
30. 20 ft = ______ in.
31. 16 yd = ______ ft
32. 21 ft = ______ in.
33. 12.5 yd = ______ in.
34. 19 ft = ______ in.
35. 2.5 yd = ______ in.
36. 16 yd = ______ in.
37. 32 yd = ______ ft
38. 40 yd = ______ ft
39. 29 yd = ______ in.
40. 5.5 yd = ______ in.
41. 0.75 yd = ______ in.
42. 0.5 yd = ______ in.
43. 0.25 yd = ______ in.
44. 0.25 ft = ______ in.
45. 0.5 ft = ______ in.
46. 0.75 ft = ______ in.
47. 1.75 yd = ______ in.
48. 2.5 ft = ______ in.
49. 3.25 yd = ______ in.
50. 1/3 yd = ______ in.

Chapter 1, Practice Set 6

Fill in the blanks.

1. 56 yd = ______ ft
2. 7 yd = ______ ft
3. 27 ft = ______ yd
4. 36 ft = ______ yd
5. 38 yd = ______ in.
6. 900 in. = ______ ft
7. 1620 in. = ______ yd
8. 16 yd = ______ in.
9. 40 yd = ______ ft
10. 504 in. = ______ yd
11. 18 ft = ______ yd
12. 36 ft = ______ in.
13. 42 ft = ______ yd
14. 21 ft = ______ yd
15. 60 ft = ______ yd
16. 36 in. = ______ ft
17. 96 in. = ______ ft
18. 72 in. = ______ ft
19. 48 in. = ______ ft
20. 120 in. = ______ ft
21. 72 in. = ______ yd
22. 180 in. = ______ yd
23. 252 in. = ______ yd
24. 108 in. = ______ yd
25. 396 in. = ______ yd
26. 126 in. = ______ yd
27. 13.75 ft = ______ in.
28. 162 in. = ______ ft
29. 10.5 yd = ______ ft
30. 5.25 yd = ______ in.
31. 6 in. = ______ ft
32. 18 in. = ______ ft
33. 3.5 ft = ______ in.
34. 3.75 ft = ______ in.
35. 42 in. = ______ ft
36. 54 in. = ______ yd
37. 90 in. = ______ ft
38. 198 in. = ______ yd
39. 18.25 ft = ______ in.
40. 2.75 yd = ______ in.
41. 0.75 yd = ______ in.
42. 0.5 yd = ______ in.
43. 0.25 yd = ______ in.
44. 0.25 ft = ______ in.
45. 0.5 ft = ______ in.
46. 0.75 ft = ______ in.
47. 1.25 yd = ______ in.
48. 2.5 ft = ______ in.
49. 3.75 yd = ______ in.
50. 1/4 yd = ______ in.

Chapter 1, Practice Set 7

Use the clues at the bottom of the page to fill in the cross number puzzle.

1	■	2	3	■	4	5
■	6		■	7		
8		■	9			■
10	■	11			■	12
■	13			■	14	
15			■	16		■
17		■	18		■	19

ACROSS

1. 24 in. = ______ ft
2. 7 ft = ______ in.
4. 3 ft = ______ in.
6. 7 yd = ______ ft
7. 57 ft = ______ in.
8. 5 yd = ______ ft
9. 10 yd = ______ in.
10. 96 in. = ______ ft
11. 66 yd = ______ ft
12. 60 in. = ______ ft
13. 8496 in. = ______ yd
14. 20 yd = ______ ft
15. 8520 in. = ______ ft
16. 16 yd = ______ ft
17. 10 yd = ______ ft
18. 75 ft = ______ yd
19. 36 in. = ______ yd

DOWN

1. 72 in. = ______ yd
2. 7 feet – 3 inches = ______ in.
3. 48 in. = ______ ft
4. 10 yards + 20 inches = ______ in.
5. 5 feet + 4 inches = ______ in.
6. 2 feet + 1 inches = ______ in.
7. 18 yards + 20 inches = ______ in.
8. 1 ½ ft = ______ in.
9. 11 yd = ______ in.
11. 12 feet – 14 inches = ______ in.
12. 4 feet + 2 inches = ______ in.
13. 6 yards – 6 inches = ______ in.
14. 6 feet – 4 inches = ______ in.
15. 7 feet – 11 inches = ______ in.
16. 4 feet – 3 inches = ______ in.
18. 24 in. = ______ ft
19. 3 ft = ______ yd

Chapter 1, Practice Set 8

Fill in the blanks in each set of five equivalents.

A

1. 4 gal = ______ qt
2. 2 gal = ______ qt
3. 6 gal = ______ qt
4. 2 ½ gal = ______ qt
5. 1 ¾ gal = ______ qt

B

1. 16 qt = ______ gal.
2. 20 qt = ______ gal
3. 32 qt = ______ gal
4. 22 qt = ______ gal
5. 42 qt = ______ gal

C

1. 4 gal = ______ pt
2. 2 gal = ______ pt
3. 6 gal = ______ pt
4. 2 ½ gal = ______ pt
5. 1 ¾ gal = ______ pt

D

1. 16 pt = ______ gal
2. 24 pt = ______ gal
3. 32 pt = ______ gal
4. 40 pt = ______ gal
5. 42 pt = ______ gal

E

1. 4 gal = ______ oz
2. 2 gal = ______ oz
3. 6 gal = ______ oz
4. 2 ½ gal = ______ oz
5. 1 ¾ gal = ______ oz

F

1. 256 oz = ______ gal
2. 640 oz = ______ gal
3. 128 oz = ______ gal
4. 384 oz = ______ gal
5. 512 oz = ______ gal

G

1. 3 qt = ______ oz
2. 5 qt = ______ oz
3. 2 qt = ______ oz
4. 8 qt = ______ oz
5. 12 qt = ______ oz

H

1. 64 oz = ______ qt
2. 128 oz = ______ qt
3. 32 oz = ______ qt
4. 256 oz = ______ qt
5. 96 oz = ______ qt

Chapter 1, Practice Set 9

Fill in the blanks in each set of five equivalents.

A

1. 3 qt = ______ pt
2. 5 qt = ______ pt
3. 2 qt = ______ pt
4. 8 qt = ______ pt
5. 12 qt = ______ pt

B

1. 64 pt = ______ qt
2. 128 pt = ______ qt
3. 32 pt = ______ qt
4. 256 pt = ______ qt
5. 96 pt = ______ qt

C

1. 5 pt = ______ oz
2. 3 pt = ______ oz
3. 6 pt = ______ oz
4. 4 pt = ______ oz
5. 1 pt = ______ oz

D

1. 80 oz = ______ pt
2. 32 oz = ______ pt
3. 16 oz = ______ pt
4. 96 oz = ______ pt
5. 48 oz = ______ pt

E

1. 6 gal = ______ qt
2. 128 oz = ______ qt
3. 5 pt = ______ oz
4. 64 oz = ______ qt
5. 32 oz = ______ pt

F

1. 32 qt = ______ pt
2. 512 oz = ______ gal
3. 4 gal = ______ pt
4. ½ gal = ______ oz
5. 16 qt = ______ pt

G

1. 4 gal = ______ qt
2. 3 gal = ______ oz
3. 2 qt = ______ oz
4. 4 qt = ______ oz
5. 4 pt = ______ oz

H

1. 2 gal = ______ pt
2. 1 gal = ______ qt
3. 3 qt = ______ pt
4. 1 qt = ______ pt
5. 3 gal = ______ oz

Chapter 1, Practice Set 10

A. Circle the one of each pair that is GREATER.

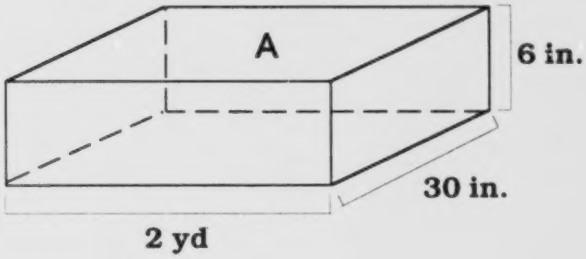
1. 5 yards or 22 feet ?
2. 60 inches or 1 yard ?
3. 3 quarts or 2 gallons ?
4. 3 pints or 40 ounces ?
5. 70 inches or 5 feet ?
6. 22 pints or 6 gallons ?
7. 128 ounces or 5 pints ?
8. 100 inches or 10 feet ?
9. 60 feet or 16 yards ?
10. 13 quarts or 25 pints ?

B. Answer each question.

1. How many feet are there in a hose that is 50 yards long? ____________
2. A customer wants to buy 27 feet of ribbon. How many yards should the customer ask for? ____________
3. How many yards of ribbon are there in a bow that is made from 24 inches of ribbon? ____________
4. A landscape sketch shows a length of 7.5 yards. How many inches is this? ____________
5. A new bolt of ribbon holds 80 yards. How many inches is this? ____________

C. Convert the following measurements as directed.

1. Convert each measurement in sketch **A** to feet.



6 in. = ____________

30 in. = ____________

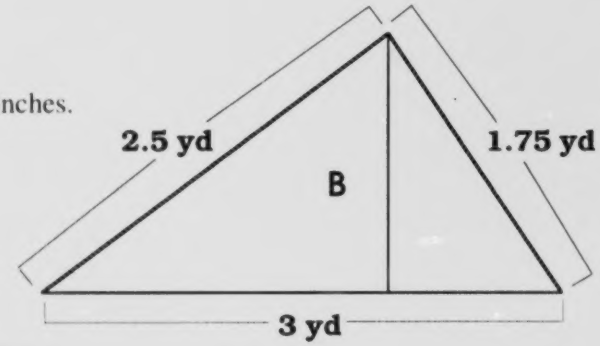
2 yd = ____________

2. Convert each measurement in sketch **B** to inches.

2.5 yd = ____________

1.75 yd = ____________

3 yd = ____________



Complete all three charts by filling in each numbered blank space.

GREEN WONDER FERTILIZER MIXING CHART

Total Solution Needed	Amount of Green Wonder Needed	Amount of Water Needed
1 gallon	2 quarts	1) ______________
2 gallons	70 ounces	2) ______________
4 gallons	15 pints	3) ______________
3 gallons	6 quarts	4) ______________
5 gallons	100 ounces	5) ______________

SHOPPING LIST

You Need	You Have	You Will Need to Add
13 yards of hose	3 feet	6) ________ feet of hose
20 feet of twine	6 yards	7) ________ feet of twine
3 yards of ribbon	45 inches	8) ________ inches of ribbon
6 yards of cord	15 feet	9) ________ feet of cord
23 feet of lights	1000 inches	10) ________ inches of lights

MIXING CHART FOR STEM DYEING FLOWERS

Total Solution Needed	Amount of Water Needed	Amount of Dye to Add
½ gallon	56 ounces	11) ______________
1 gallon	7 pints	12) ______________
4 gallons	13) ______________	32 ounces
10 gallons	14) ______________	1.5 quarts
3 gallons	15) ______________	3 pints

Answer each question and fill in the blanks.

1. 15 yards of rope cost $18.75. How much will 32 feet of rope cost? $ ________

2. A 25-yard hose costs $9.95. How much will 100 feet of hose cost? $ ________

3. 3 yards of ribbon cost $1.30. How much will 20 feet of ribbon cost? $ ________

4. 5 yards of plastic edging cost $12.98. How much will 100 feet of edging cost? $ ________

5. 3 gallons of insecticide cost $45.00. How much will 3 quarts of insecticide cost? $ ________

6. 12 gallons of liquid fertilizer cost $98.00. How much will 10 quarts of fertilizer cost? $ ________

7. 9 gallons of growth retardant cost $567.00. How much will 2 quarts of growth retardant cost? $ ________

8. 5 feet of ribbon cost $2.25. How much will 6 yards of ribbon cost? $ ________

9. 50 feet of hose cost $11.49. How much will 25 yards of hose cost? $ ________

10. 2 gallons of fertilizer cost $18.50. How much will 3 pints of fertilizer cost? $ ________

11. 15 gallons of whitewash cost $50.00. How much will 6 quarts of whitewash cost? $ ________

12. 10 feet of plastic edging cost $14.35. How much will 15 yards of edging cost? $ ________

Chapter 1, Practice Set 13

Answer each question and fill in the blanks.

1. 5 yards of rope cost $49.00. How much will 32 feet of rope cost? $ ________

2. A 20-yard hose costs $7.99. How much will 100 feet of hose cost? $ ________

3. 2 yards of ribbon cost $.89. How much will 20 feet of ribbon cost? $ ________

4. 6 yards of plastic edging cost $15.50. How much will 110 feet of edging cost? $ ________

5. 3 gallons of insecticide cost $45.00. How much will 2 quarts of insecticide cost? $ ________

6. 10 gallons of liquid fertilizer costs $82.00. How much will 7 quarts of liquid fertilizer cost? $ ________

7. 6 gallons of growth retardant cost $378.00. How much will 3 quarts of growth retardant cost? $ ________

8. 4 feet of ribbon cost $1.80. How much will 6 yards of ribbon cost? $ ________

9. 50 feet of hose cost $11.49. How much will 30 yards of hose cost? $ ________

10. 4 gallons of fertilizer cost $37.00. How much will 3 pints of fertilizer cost? $ ________

11. 3 quarts of insecticide cost $21.79. How much will 3 gallons of insecticide cost? $ ________

12. 5 pints of liquid fertilizer cost $5.78. How much will 4 gallons of liquid fertilizer cost? $ ________

13. 6 gallons of whitewash cost $20.00. How much will 15 quarts of whitewash cost? $ ________

14. 20 yards of shade cloth cost $100.00. How much will 30 feet of shade cloth cost? $ ________

Chapter 1, Practice Set 14

A. Draw line segments with the following metric measurements.

1) 5 cm

2) 3 cm

3) 12 cm

4) 9 cm

5) 2 cm

6) 6 cm

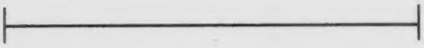
7) 14 cm

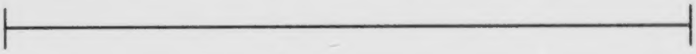
8) 1 cm

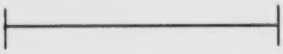
9) 8 cm

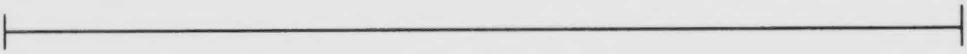
10) 10 cm

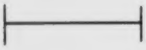
B. Measure each of the following line segments. Write its length in centimeters in the space to the right.

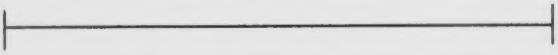
11)  ______

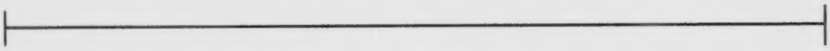
12)  ______

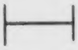
13)  ______

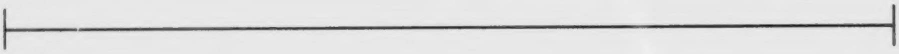
14)  ______

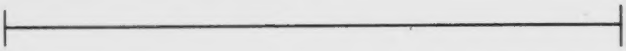
15)  ______

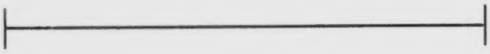
16)  ______

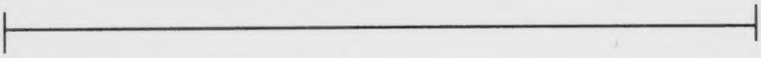
17)  ______

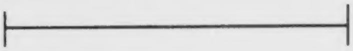
18)  ______

19)  ______

20)  ______

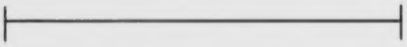
21)  ______

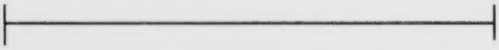
22)  ______

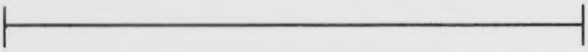
23)  ______

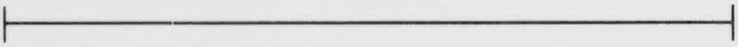
Chapter 1, Practice Set 15

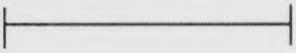
A. Measure each of the following line segments. Write its length in millimeters in the space to the right.

1)  ________

2)  ________

3)  ________

4)  ________

5)  ________

B. Draw line segments with the following metric measurements.

6) 2.5 cm

7) 16 mm

8) 13 cm

9) 12 mm

10) 4.6 cm

11) 22 mm

12) 5.3 cm

13) 1.2 cm

14) 11 cm

15) 14.4 cm

16) 25 mm

17) 3.9 cm

18) 40 mm

19) 7.8 cm

20) 87 mm

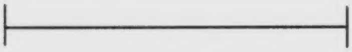
21) 127 mm

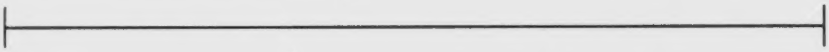
22) 10.5 cm

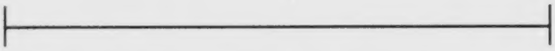
23) 5.2 cm

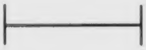
Chapter 1, Practice Set 16

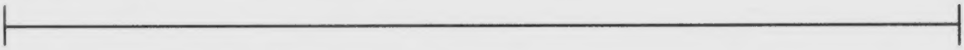
A. Measure each of the following line segments. Write its length in decimeters in the space to the right.

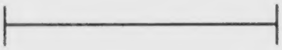
1)  ________

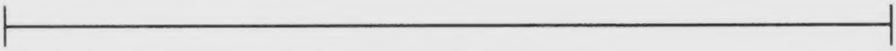
2)  ________

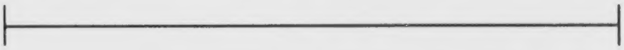
3)  ________

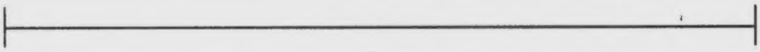
4)  ________

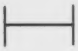
5)  ________

6)  ________

7)  ________

8)  ________

9)  ________

10)  ________

B. Draw line segments with the following metric measurements.

11) 1.2 dm

12) 15 cm

13) 24 mm

14) 5 mm

15) 12.2 cm

16) 1.6 dm

17) 160 mm

18) 0.8 dm

19) 1.7 cm

20) 1.3 dm

21) 14.3 cm

22) 11.1 cm

23) 65 mm

24) 18 mm

Chapter 1, Practice Set 17

Use the clues at the bottom of the page to fill in the cross number puzzle.

1	■	2	3	■	4	5
■	6		■	7		
8		■	9			■
10	■	11			■	12
■	13			■	14	
15			■	16		■
17		■	18		■	19

ACROSS

1. 10 dm = ______ m
2. 6 dm = ______ cm
4. 550 cm = ______ dm
6. 100 cm = ______ dm
7. 6500 mm = ______ cm
8. 1200 cm = ______ m
9. 6200 mm = ______ cm
10. 80 cm = ______ dm
11. 7500 mm = ______ cm
13. 6.25 m = ______ cm
14. 5 m = ______ dm
15. 87.5 dm = ______ cm
16. 1.5 m = ______ dm
17. 800 cm = ______ dm
18. 0.32 m = ______ cm
19. 100 cm = ______ m

DOWN

2. 6 m = ______ dm
4. 55 cm = ______ mm
5. 5 dm = ______ cm
6. 120 dm = ______ m
7. 62 dm = ______ cm
8. 180 cm = ______ dm
9. 6.55 m = ______ cm
11. 72.5 cm = ______ mm
12. 6 dm = ______ cm
13. .67 m = ______ mm
14. 5.5 dm = ______ cm
15. 8.8 dm = ______ cm
16. 1.2 m = ______ dm

Chapter 1, Practice Set 18

Use a proportion to make each of the following conversions.

A

1. 2 m = ______ dm
2. 5 m = ______ dm
3. 7 m = ______ dm
4. 3 m = ______ dm
5. 17 m = ______ dm

B

1. 50 dm = ______ m
2. 80 dm = ______ m
3. 40 dm = ______ m
4. 20 dm = ______ m
5. 150 dm = ______ m

C

1. 6 m = ______ cm
2. 4 m = ______ cm
3. 8 m = ______ cm
4. 12 m = ______ cm
5. 9 m = ______ cm

D

1. 700 cm = ______ m
2. 300 cm = ______ m
3. 500 cm = ______ m
4. 100 cm = ______ m
5. 1200 cm = ______ m

E

1. 5 m = ______ mm
2. 2 m = ______ mm
3. 7 m = ______ mm
4. 3 m = ______ mm
5. 17 m = ______ mm

F

1. 8000 mm = ______ m
2. 5000 mm = ______ m
3. 4000 mm = ______ m
4. 2000 mm = ______ m
5. 1500 mm = ______ m

G

1. 10 dm = ______ cm
2. 20 dm = ______ cm
3. 30 dm = ______ cm
4. 40 dm = ______ cm
5. 80 dm = ______ cm

H

1. 500 cm = ______ mm
2. 200 cm = ______ mm
3. 300 cm = ______ mm
4. 100 cm = ______ mm
5. 700 cm = ______ mm

I

1. 4500 mm = ______ cm
2. 3000 mm = ______ cm
3. 2500 mm = ______ cm
4. 6000 mm = ______ cm
5. 8000 mm = ______ cm

J

1. 400 cm = ______ dm
2. 650 cm = ______ dm
3. 300 cm = ______ dm
4. 250 cm = ______ dm
5. 500 cm = ______ dm

Chapter 1, Practice Set 19

Use a proportion to make each of the following conversions.

A

1. 2 m = ______ cm
2. 5 m = ______ mm
3. 17 m = ______ dm
4. 3 m = ______ mm
5. 27 m = ______ dm

B

1. 50 dm = ______ mm
2. 80 dm = ______ cm
3. 4 dm = ______ m
4. 20 dm = ______ mm
5. 15 dm = ______ m

C

1. 6 m = ______ mm
2. 14 m = ______ cm
3. 28 m = ______ cm
4. 22 m = ______ dm
5. 90 m = ______ cm

D

1. 700 cm = ______ dm
2. 30 cm = ______ m
3. 50 cm = ______ mm
4. 100 cm = ______ m
5. 120 cm = ______ m

E

1. 50 m = ______ mm
2. 22 m = ______ mm
3. 75 m = ______ cm
4. 37 m = ______ dm
5. 17 m = ______ cm

F

1. 800 mm = ______ m
2. 50 m = ______ cm
3. 4500 mm = ______ m
4. 2100 mm = ______ dm
5. 150 mm = ______ cm

G

1. 10 m = ______ cm
2. 25 dm = ______ m
3. 3 m = ______ cm
4. 40 cm = ______ mm
5. 80 mm = ______ cm

H

1. 500 cm = ______ m
2. 250 cm = ______ mm
3. 325 cm = ______ dm
4. 100 cm = ______ dm
5. 70 cm = ______ mm

I

1. 450 m = ______ cm
2. 30 mm = ______ cm
3. 250 mm = ______ dm
4. 6400 mm = ______ m
5. 80 dm = ______ cm

J

1. 400 m = ______ dm
2. 650 cm = ______ m
3. 300 cm = ______ mm
4. 250 cm = ______ m
5. 500 dm = ______ mm

Chapter 1, Practice Set 20

Use a proportion to make each of the following conversions.

A

1. 3 liters = ______ dl
2. 4 liters = ______ dl
3. 8 liters = ______ dl
4. 9 liters = ______ dl
5. 27 liters = ______ dl

B

1. 50 dl = ______ liters
2. 60 dl = ______ liters
3. 40 dl = ______ liters
4. 30 dl = ______ liters
5. 250 dl = ______ liters

C

1. 5 liters = ______ cl
2. 4 liters = ______ cl
3. 11 liters = ______ cl
4. 12 liters = ______ cl
5. 9 liters = ______ cl

D

1. 700 cl = ______ liters
2. 650 cl = ______ liters
3. 600 cl = ______ liters
4. 100 cl = ______ liters
5. 1200 cl = ______ liters

E

1. 5 liters = ______ ml
2. 2 liters = ______ ml
3. 7 liters = ______ ml
4. 3 liters = ______ ml
5. 19 liters = ______ ml

F

1. 8000 ml = ______ liters
2. 6000 ml = ______ liters
3. 4000 ml = ______ liters
4. 2000 ml = ______ liters
5. 4500 ml = ______ liters

G

1. 10 dl = ______ cl
2. 20 dl = ______ cl
3. 60 dl = ______ cl
4. 40 dl = ______ cl
5. 80 dl = ______ cl

H

1. 600 cl = ______ ml
2. 900 cl = ______ ml
3. 300 cl = ______ ml
4. 100 cl = ______ ml
5. 750 cl = ______ ml

I

1. 4500 ml = ______ cl
2. 3000 ml = ______ cl
3. 2500 ml = ______ cl
4. 6800 ml = ______ cl
5. 8500 ml = ______ cl

J

1. 400 cl = ______ dl
2. 650 cl = ______ dl
3. 300 cl = ______ dl
4. 250 cl = ______ dl
5. 500 cl = ______ dl

Chapter 1, Practice Set 21

Use a proportion to make each of the following conversions.

A

1. 7 liters = ______ cl
2. 5 liters = ______ ml
3. 37 liters = ______ dl
4. 3 liters = ______ ml
5. 25 liters = ______ dl

B

1. 50 dl = ______ ml
2. 80 dl = ______ cl
3. 45 dl = ______ liters
4. 32 dl = ______ ml
5. 15 dl = ______ liters

C

1. 5 liters = ______ ml
2. 24 liters = ______ cl
3. 30 liters = ______ cl
4. 22 liters = ______ dl
5. 49 liters = ______ cl

D

1. 600 cl = ______ dl
2. 35 cl = ______ liters
3. 500 cl = ______ ml
4. 100 cl = ______ liters
5. 120 cl = ______ liters

E

1. 50 liters = ______ ml
2. 30 liters = ______ ml
3. 75 liters = ______ cl
4. 29 liters = ______ dl
5. 47 liters = ______ cl

F

1. 800 ml = ______ liters
2. 50 liters = ______ cl
3. 4000 ml = ______ liters
4. 2500 ml = ______ dl
5. 200 ml = ______ cl

G

1. 10 liters = ______ cl
2. 30 dl = ______ liters
3. 35 liters = ______ cl
4. 40 cl = ______ ml
5. 80 ml = ______ cl

H

1. 550 cl = ______ liters
2. 200 cl = ______ ml
3. 350 cl = ______ dl
4. 100 cl = ______ dl
5. 75 cl = ______ ml

I

1. 400 liters = ______ cl
2. 30 ml = ______ cl
3. 550 ml = ______ dl
4. 5600 ml = ______ liters
5. 85 dl = ______ cl

J

1. 350 liters = ______ dl
2. 650 cl = ______ liters
3. 200 cl = ______ ml
4. 750 cl = ______ liters
5. 300 dl = ______ ml

Chapter 1, Practice Set 22

Use a proportion to make each of the following conversions.

A

1. 7 liters = ______ cu cm
2. 5 liters = ______ cu cm
3. 37 liters = ______ cu cm
4. 3 liters = ______ cu cm
5. 25 liters = ______ cu cm

B

1. 50 dl = ______ cu cm
2. 80 dl = ______ cu cm
3. 45 dl = ______ cu cm
4. 32 dl = ______ cu cm
5. 15 dl = ______ cu cm

C

1. 120 cu cm = ______ ml
2. 1200 cu cm = ______ ml
3. 1500 cu cm = ______ cl
4. 270 cu cm = ______ cl
5. 2000 cu cm = ______ dl

D

1. 500 cu cm = ______ liters
2. 750 cu cm = ______ dl
3. 9000 cu cm = ______ cl
4. 675 cu cm = ______ ml
5. 8500 cu cm = ______ liters

Circle one of each pair.

E. Which is greater?

1. 5 m or 23 dm
2. 170 cm or 7 m
3. 62 dm or 700 mm
4. 8 m or 720 cm
5. 5500 mm or 2 m

F. Which is smaller?

1. 5 liters or 550 cl
2. 23 ml or 0.5 liter
3. 12 liters or 1250 ml
4. 2 liters or 2500 cl
5. 5000 ml or 2 liters
6. 560 ml or 6 liters
7. 8500 ml or 10 liters

G. Which is smaller?

1. 5 ml or 2 cu cm
2. 54 dm or 45 cm
3. 15 liters or 20,000 cu cm
4. 35 cu cm or 3 dl
5. 25 ml or 2 cl

H. Which is greater?

1. 12 liters or 150 cl
2. 56 ml or 5 dl
3. 340 ml or 12 liters
4. 14 liters or 150 dl
5. 7 m or 710 cm
6. 7 liters or 75 ml
7. 22 m or 2500 mm

CHAPTER 2

GEOMETRY FOR THE LANDSCAPE

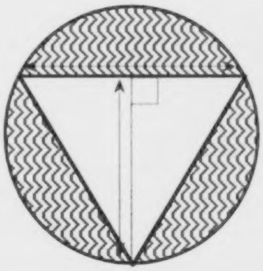
By the time you finish this chapter, you will be able to calculate

1) the perimeter of a given section of land.
2) the area of a given section of land.
3) the volume of a container.

* * * * * * * * * * * * * * *

Everyone who works in the field of horticulture needs a knowledge of geometry. This is true whether you are a greenhouse worker, landscape worker, or designer in a floral shop. The geometry you need is not the typical kind you study in high school. There are no theorems to prove, no difficult axioms to learn. But there are some basic rules that you should understand and be able to use. First, you will need to become familiar with terms such as the following that are used by landscapers.

perimeter (P) - the distance around
Example: If you were to walk all around the outside of a flower garden, you would be walking on the *perimeter*.



area (A) - the space contained inside the perimeter
Example: If you were to lay cardboard squares to cover the flower garden completely, you would be covering the *area*.

volume (V) - how much fits in a given space
Example: When you fill a hanging basket container with soil, you are filling its *volume*.

circumference (C) - the perimeter of a circle

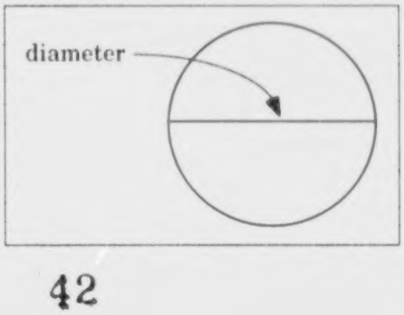
diameter (d) - the line that divides a circle into two equal parts. It passes through the center and intersects the circle in two places (Figure 2-1).

radius (r) - one half of the diameter

pi (π) - the equivalent of 3.14 or 22/7

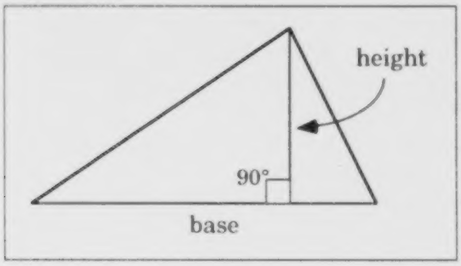
height - line segment that shows how tall a triangle is. It is always drawn from a corner of the triangle to the opposite side, forming a 90° angle with that side. In a diagram, the little box at the bottom of the height indicates the 90° angle (Figure 2-2).

Figure 2-1



42

Figure 2-2


height
90°
base

base - the side of the triangle to which the height is drawn.

Perimeter

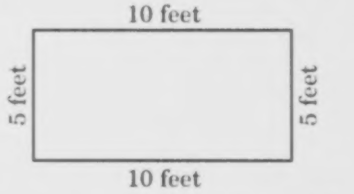
Perimeter of a Rectangle

It is usually easy to calculate the perimeter of a section of land. Measure the length of each side of the section and then add all the figures together.

perimeter (P) = sum of sides

Examples

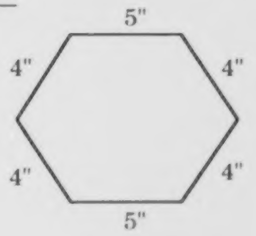
Figure 2-3


10 feet
5 feet
5 feet
10 feet

P = 5 ft + 10 ft + 5 ft + 10 ft

P = 30 ft

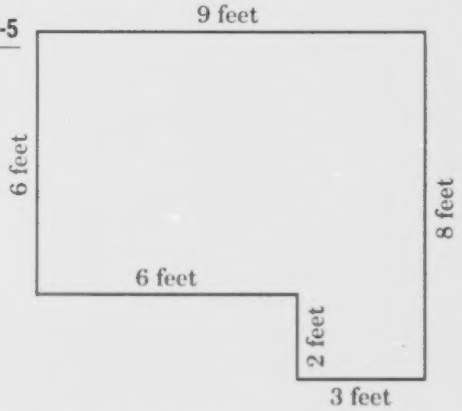
Figure 2-4



P = 5 in. + 4 in. + 4 in. +
5 in. + 4 in. + 4 in.

P = 26 in.

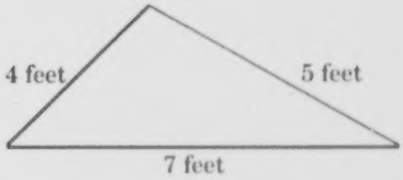
Figure 2-5


9 feet
6 feet
8 feet
6 feet
2 feet
3 feet

P = 6 ft + 9 ft + 8 ft + 3 ft + 2 ft + 6 ft

P = 34 ft

Figure 2-6


4 feet
5 feet
7 feet

P = 5 ft + 7 ft + 4 ft

P = 16 ft

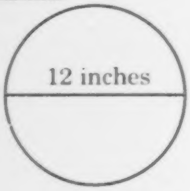
Perimeter of a Circle

Then you encounter a circular region that has no sides to measure. A circular region has a perimeter that is called the circumference. You can calculate the circumference of a circle by multiplying the length of the diameter by **pi** (π) (3.14).

$$\textbf{circumference (C)} = \textbf{diameter} \times \pi$$

Examples

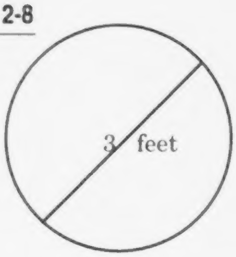
Figure 2-7



C = 12 in. x 3.14

C = 37.68 in.

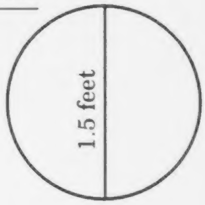
Figure 2-8



C = 3 ft x 3.14

C = 9.42 ft

Figure 2-9

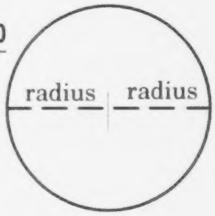


C = 1.5 ft x 3.14

C = 4.71 ft

Finally, the diameter is composed of two equal line segments, each of which is called a radius (**r**) (Figure 2-10).

Figure 2-10



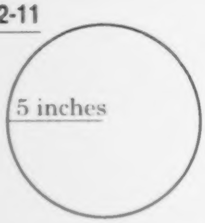
$$\textbf{diameter} = \textbf{radius} \times 2$$

You can also calculate the circumference of a circle using the length of the radius.

$$\textbf{circumference (C)} = \textbf{radius} \times 2 \times \pi$$

Examples

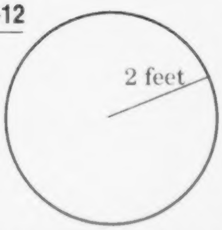
Figure 2-11



C = (5 in.) (2) (3.14)

C = 31.4 in.

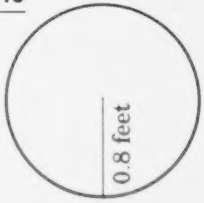
Figure 2-12



C = (2 ft) (2) (3.14)

C = 12.56 ft

Figure 2-13



C = (0.8 ft) (2) (3.14)

C = 5.024 ft

Notice that in all these perimeter calculations, each answer is labeled with the unit used to measure the diagram-figure. Because each calculation represents a measurement, every answer **must** carry the appropriate unit of measure.

Area

Area, the space inside the perimeter, is measured in squares like the theoretical cardboard ones laid on the flower garden. These squares can be 1 inch by 1 inch, 1 foot by 1 foot, or whatever is the unit of choice. Because area is measured with squares, you can not mix types of measuring units, like 5 inches and 5 feet.

To calculate the area of any space, you will need to learn three rules: one to use for rectangles and squares, one to use for triangles, and the third to use for circles.

1 - Area of Rectangles and Squares

Look at the rectangle in Figure 2-14. One side measures 4 units and the other side measures 2 units. Figure 2-15 divides the sides into units so that the area of the rectangle is filled with squares. How many squares are there? What is the area of this rectangle?

Figure 2-14

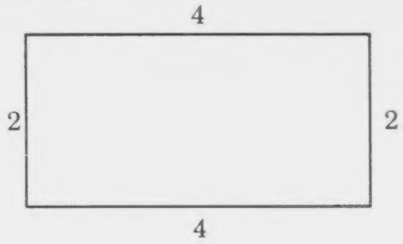
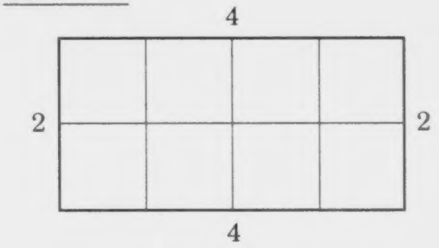


Figure 2-15



There are 8 squares in the rectangle. The area of the rectangle is 8 square units.

Now look at the square in Figure 2-16. Each side measures 3 units. Figure 2-17 divides the sides into units so that the area of the square is filled with squares. How many squares are there? What is the area of the large square?

Figure 2-16

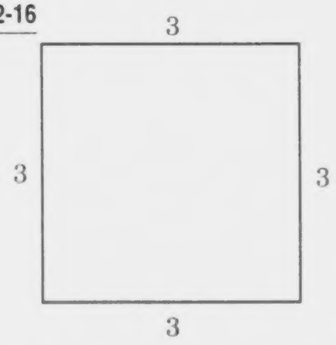
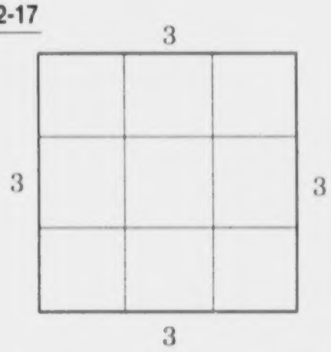


Figure 2-17



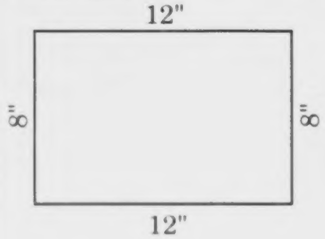
There are 9 squares contained in the large square. The area of the large square is 9 square units.

You can now see that the area of a rectangle or square is found by multiplying together the measurements of two sides that form a corner of the figure. Label the answer as square units like square inches or square feet. Remember, we use this label because we are measuring with squares.

area of a square or rectangle = side x side

Examples

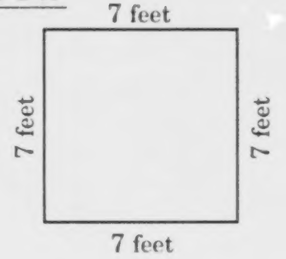
Figure 2-18



A = 12 in. x 8 in.

A = 96 sq in.

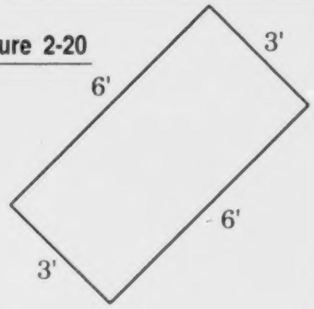
Figure 2-19



A = 7 ft x 7 ft

A = 49 sq ft

Figure 2-20



A = 6 ft x 3 ft

A = 18 sq ft

2 - Area of a Triangle

In the rectangle in Figure 2-21, a line is drawn from corner A to corner C. This line divides the rectangle into two triangles. You can see that

area of Δ ACD + area of Δ ABC = area of the rectangle

Now let's separate the triangles as shown in Figure 2-22. Then rotate Δ ABC so it sits the same way as Δ ADC.

Compare the triangles after this rotation. You can see that all sides measure the same. You can deduce that these triangles have the same area.

Figure 2-21

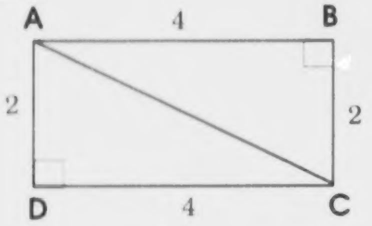
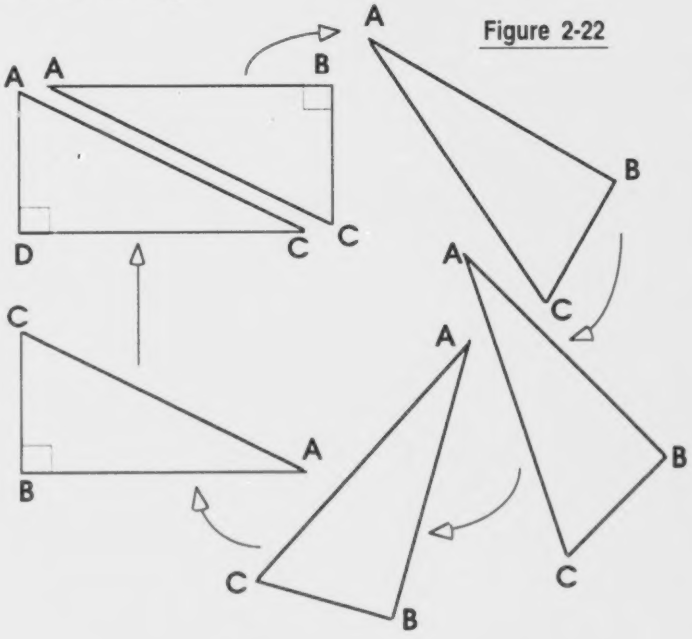


Figure 2-22



Now it is clear that the area of Δ ADC is equal to the area of the rectangle (ABCD) divided by 2. Furthermore, the area of Δ ABC must also be equal to the area of the rectangle divided by 2. This will help you understand the area rule for triangles.

Before studying this second rule, you need to become familiar with the parts of a triangle. Study the diagrams that follow. Be sure you can locate the base and the height of each triangle.

Figure 2-23

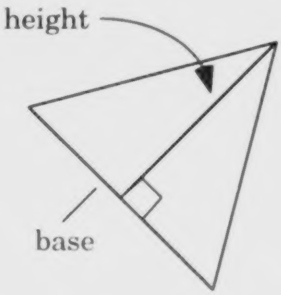

height
base

Figure 2-24

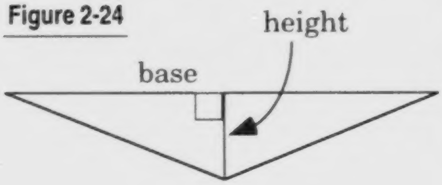
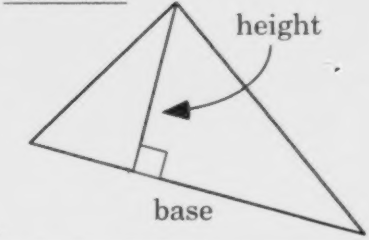

height
base

Figure 2-25

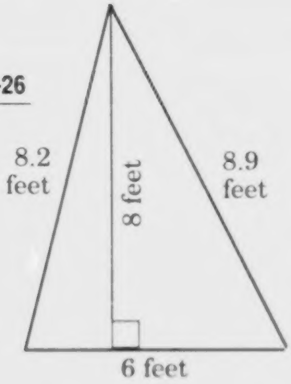

height
base

To calculate the area of a triangle, multiply the length of the base of the triangle by the length of the height of the triangle and then divide the answer by 2. Give the answer in square units (such as square feet).

area of triangle = (height x base) ÷ 2

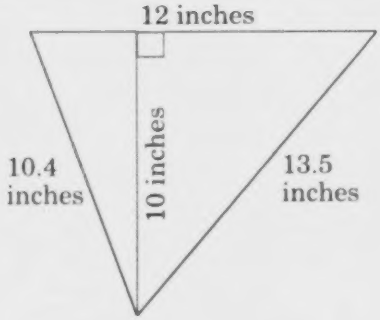
Examples

Figure 2-26


8.2 feet
8 feet
8.9 feet
6 feet

A = (8 ft x 6 ft) ÷ 2
A = 48 sq ft ÷ 2
A = 24 sq ft

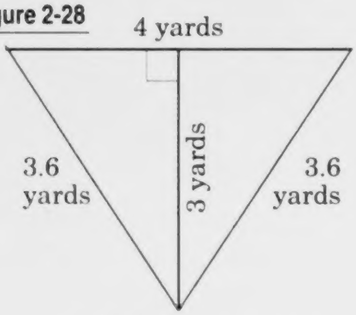
Figure 2-27


12 inches
10.4 inches
10 inches
13.5 inches

A = (10 in. x 12 in.) ÷ 2
A = 120 sq in. ÷ 2
A = 60 sq in.

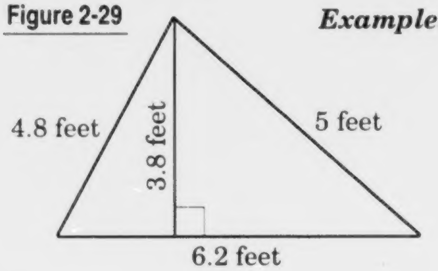
Examples

Figure 2-28



$A = (3 \text{ yd x } 4 \text{ yd}) \div 2$
$A = 12 \text{ sq yd} \div 2$
$A = 6 \text{ sq yd}$

Figure 2-29



$A = (3.8 \text{ ft x } 6.2 \text{ ft}) \div 2$
$A = 23.56 \text{ sq ft} \div 2$
$A = 11.78 \text{ sq ft}$

---

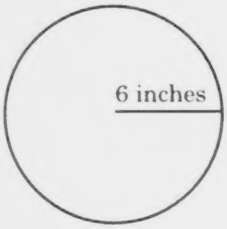
3 - Area of a Circle

You will recall from the discussion of circumference that a diameter is composed of two equal segments, each called a radius. This measurement is needed to calculate the area of a circle. You can find the area of a circle by multiplying a radius by a second radius and then multiplying by the number pi. The answer is labeled in **square** units like square inches or square feet.

area of a circle = radius x radius x π

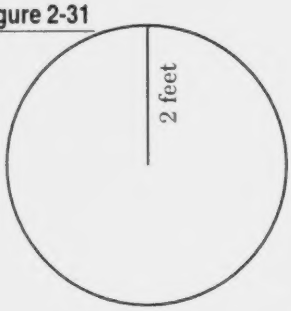
Examples

Figure 2-30



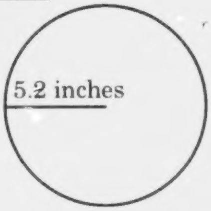
$A = (6)(6)(3.14)$
$A = 113.04$ square inches

Figure 2-31



$A = (2)(2)(3.14)$
$A = 12.56$ square feet

Figure 2-32



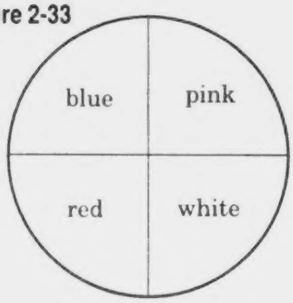
$A = (5.2)(5.2)(3.14)$
$A = 84.9056$ square inches

Here is a **summary** of all three rules for finding areas:

RULE 1 - square, rectangle	**A = side x side**
RULE 2 - triangle	**A = (height x base) ÷ 2**
RULE 3 - circle	**A = radius x radius x π**

Some calculations for area do not seem at first to fit into the three rules. However, you will find that the three rules do apply. Some project measurement simply must be done in a more creative way. For example, Figure 2-33 is a diagram of a proposed garden to be planted in an amusement park. As designer of the garden, you will need to determine the area to set aside for each color in the project. How can you do this?

Figure 2-33



diameter = 18 feet

✿ First, calculate the area of the entire garden.

A = radius x radius x π

A = 9 ft x 9 ft x 3.14 = 254.34 square feet

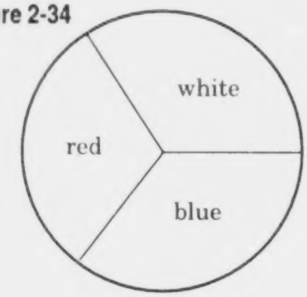
✿ Second, notice that the circular region is divided into four equal pie wedges. The area of each wedge can be calculated by dividing the total area by 4.

A ÷ 4 = area of pie wedge

254.34 sq ft ÷ 4 = 63.585 *or* 63.6 square feet

How would you calculate the area of the blue section of the garden in Figure 2-34?

Figure 2-34



diameter = 12 feet

✿ Find the total area of the circular region.

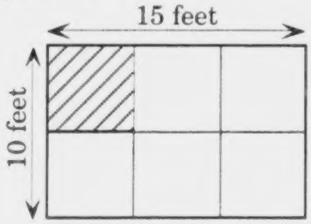
A = 6 ft x 6 ft x 3.14 = 113.04 square feet

✿ Divide the total area by 3.

113.04 ÷ 3 = 37.68 *or* 37.7 square feet

Now find the area of the shaded section of the garden in Figure 2-35.

Figure 2-35



✿ Find the total area of the rectangular region.

A = 10 ft x 15 ft = 150 square feet

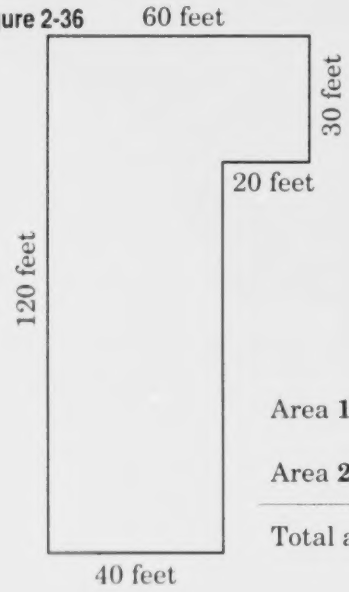
✿ Divide the total area by 6.

150 ÷ 6 = 25 square feet

In the "real world" you will seldom find a project composed of perfect geometrical shapes like the ones you have been finding areas and perimeters for. A customer might bring you a diagram of her property like Figure 2-36. She asks you how much fertilizer she will need to apply to the lawn. You must find the total area of the lawn before you can answer her question.

Because this is not a single standard shape, first divide the drawing into shapes for which there are rules, as in Figure 2-37. Notice that there are now two rectangular areas. Calculating the area of each is an easy task.

Figure 2-36

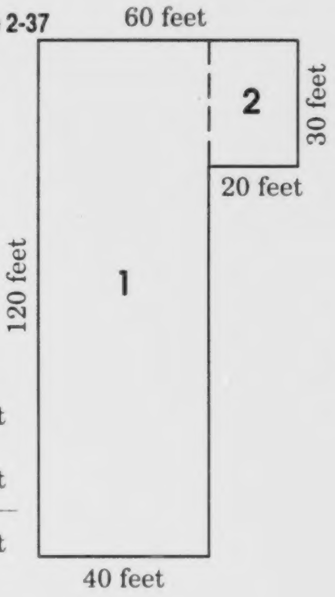


Area **1** = 120 x 40 = 4800 square feet

Area **2** = 30 x 20 = 600 square feet

Total area = 5400 square feet

Figure 2-37



After you have calculated the measurements for the project, you will find it easy to apply the three area rules.

Often you will need to examine a drawing closely to find all the measurements needed. Look at Figure 2-38.

✿ How can you determine the length of line **a**? First, you observe that **a** is a vertical measurement. Look for other vertical measurements in the drawing. You will find measurements of 60 feet and 20 feet. Compare these measurements to **a** to find the longest one. 60 feet is greater than 20 feet and appears to be longer than **a**. To find **a**, subtract 20 feet from 60 feet.

a = 60 ft – 20 ft = 40 ft

a = 40 feet

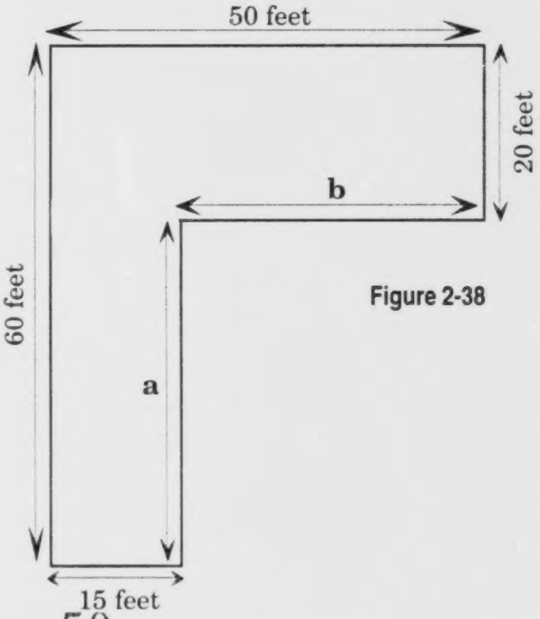


Figure 2-38

✿ How can you find the length of line **b**? First, you observe that **b** is a horizontal measurement. Look for other horizontal measurements in the drawing. You will find measurements of 50 feet and 15 feet. 50 feet is greater than 15 feet, and 50 feet appears to be greater than **b**. To find **b**, subtract 15 feet from 50 feet.

b = 50 ft – 15 ft = 35 ft

b = 35 feet

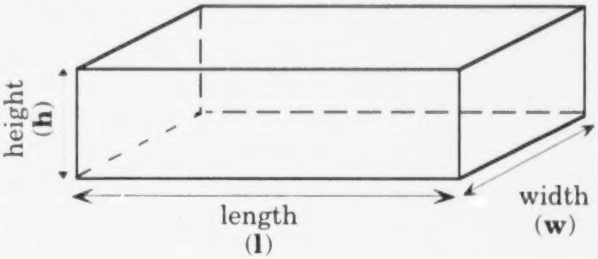
Volume

The last topic we will discuss in this chapter is calculation of volume. Volume, as we learned, involves *how much* a container can hold. Containers used in the horticulture industry are the ones we will consider.

Though there are other types of containers used in the horticulture industry, these three – box, cylinder and ball – represent the basic types for which volumes are calculated.

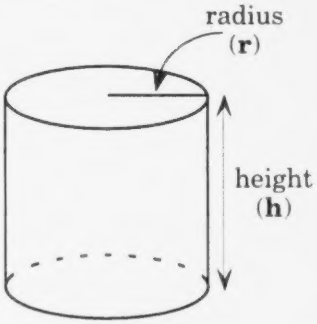
BOX (right rectangular solid)

l length - longest side
w width - shorter side
h height - how deep the container is



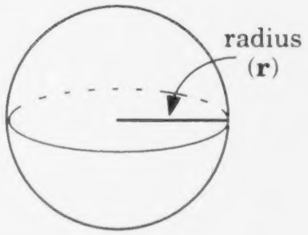
CYLINDER

r radius - ½ the diameter of the circular top or bottom
h height - how deep the container is



BALL (sphere)

r radius - ½ the diameter of the sphere



Volume of Boxes

The volume of boxes is measured with cubes – blocks that have the same measurement for length, width, and height. A cube could measure 1 inch on a side, 1 foot on a side, or 1 yard on a side (to mention just a few). When you calculate the volume, you ask, "How many cubes will it take to fill the container?"

To find the volume of a box like the one in Figure 2-39, picture covering the bottom of the box with cubes of uniform size. Continue adding rows of cubes until the box is filled to the top. The total amount of space the cubes occupy in the box represents the volume of the box.

Figure 2-40 shows that 8 cubes will cover the bottom of the box. You can also see that with the addition of two more rows, each containing 8 cubes, the box will be full. The total number of cubes in the box would be 24. The volume of the box is 24 cubic units.

Figure 2-39

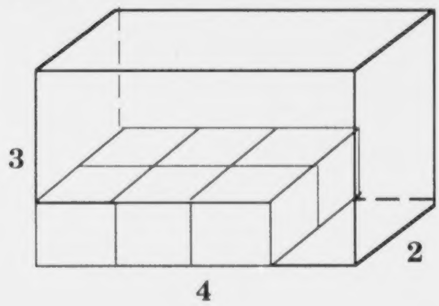
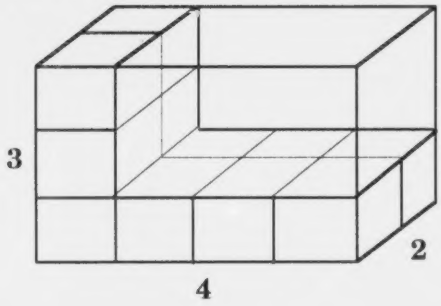


Figure 2-40



Of course, it is not practical to count the number of cubes a box would hold whenever you need to find its volume. There is a more direct way, which leads to a rule for calculating volume. Look again at the box in Figure 2-39. Its dimensions are given. Can you calculate the area of the bottom of the box?

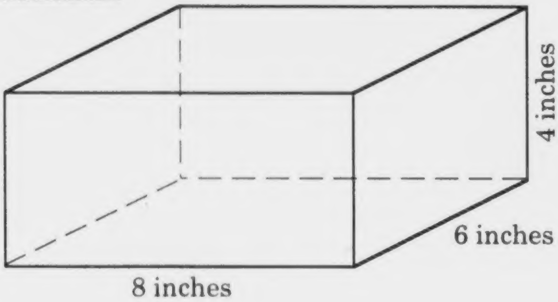
Area of the bottom = 4 feet x 2 feet = 8 square feet

Remember that the number of cubes on the bottom of the box was also 8. Also, there were 3 rows of 8 cubes, and the height of the box was 3. So, it can be concluded that the area of the bottom of the box multiplied by the height gives you the volume for the box: 24 cubic units.

volume of a box = area of the bottom x height

Examples

Figure 2-41

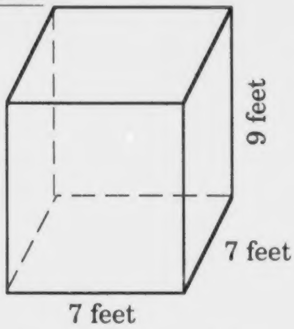


Area of bottom = 6 inches x 8 inches

height = 4 inches

Volume = 6 inches x 8 inches x 4 inches = 192 cubic inches

Figure 2-42



Area of bottom = 7 feet x 7 feet

height = 9 feet

Volume = 7 feet x 7 feet x 9 feet = 441 cubic feet

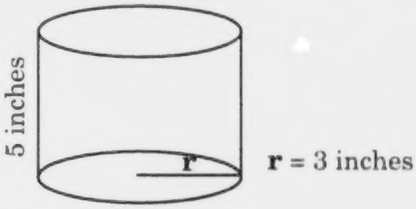
Volume of a Cylinder

The process used to find the volume of a box could also be used to find the volume of a cylinder. Though cubes do not fit exactly into a circular region, the process is very similar. The volume of a cylinder is found by calculating the area of the bottom of the container and multiplying it by the height of the container. The answer is given in cubic units because the volume is measured with cubes.

volume of a cylinder = area of the bottom x height

Examples

Figure 2-43

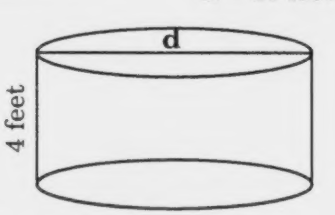


Area of bottom = 3 in. x 3 in. x 3.14

height = 5 in.

Volume = 3 in. x 3 in. x 3.14 x 5 in. = 141.3 cubic inches

Figure 2-44



Area of bottom = 5 ft x 5 ft x 3.14

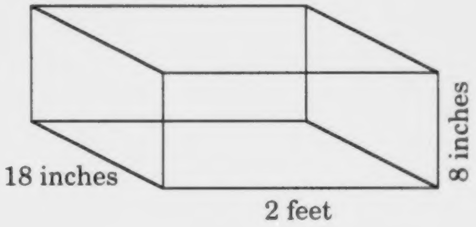
height = 4 ft

Volume = 5 ft x 5 ft x 3.14 x 4 ft = 314 cubic feet

Using the *Same* Unit of Measure

Remember, all measurements used in the calculation of volume **must** be expressed in the **same unit of measure** (whether in inches, feet, yards, or in metric units). For example, look at the container in Figure 2-45. Before you can calculate its volume, you must make sure that all measurements are expressed in the same unit: inches **or** feet, not a mixture of the two.

Figure 2-45



You will recall from Chapter 1 that units of measure can be converted by using proportions. Because 12 inches equals one foot, the following proportions can be written to convert 8 inches and 18 inches to feet, or 2 feet to inches.

$$\frac{12\text{ in.}}{1\text{ ft}} = \frac{\textbf{8 in.}}{?} = \frac{1\text{ ft x }8\,\cancel{\text{in.}}}{12\,\cancel{\text{in.}}} = \frac{8}{12}\text{ ft}$$

$$\frac{12\text{ in.}}{1\text{ ft}} = \frac{\textbf{18 in.}}{?} = \frac{1\text{ ft x }18\,\cancel{\text{in.}}}{12\,\cancel{\text{in.}}} = \frac{18}{12}\text{ ft}$$

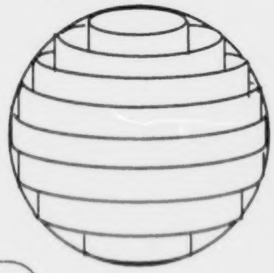
$$\frac{1\text{ ft}}{12\text{ in.}} = \frac{\textbf{2 ft}}{?} = \frac{12\text{ in. x }2\text{ ft}}{1\text{ ft}} = 24\text{ in.}$$

The volume calculation for the box in Figure 2-45, then,

in feet is:	**in inches is:**
V = 2 x 18/12 x 8/12	V = 24 x 18 x 8
V = 2 cubic feet	V = 3,456 cubic inches

Volume of a Sphere

Figure 2-46

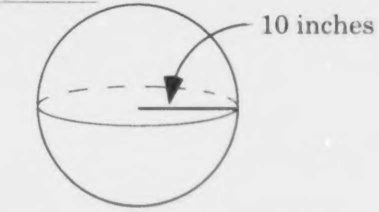


The volume of a sphere can be approximated by stacking cylinders of the same height but varying diameters on top of each other inside the sphere (Figure 2-46). You could find the volume of each cylinder and then add them all together to represent the volume of the sphere. However, this calculation would be at best only a good guess because the cylinders do not fit exactly into the sphere.

volume of a sphere = 4/3 x π x radius x radius x radius

Examples

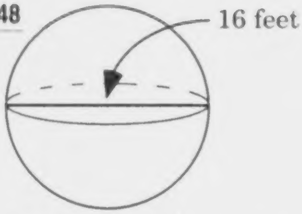
Figure 2-47



V = 4/3 x 3.14 x 10 in. x 10 in. x 10 in.

V = 4186.7 cubic inches

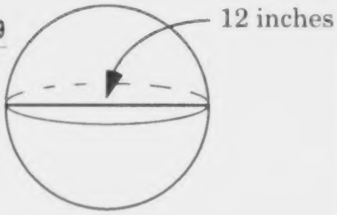
Figure 2-48



V = 4/3 x 3.14 x 8 feet x 8 feet x 8 feet

V = 2143.6 cubic feet

Figure 2-49



V = 4/3 x 3.14 x 6 in. x 6 in. x 6 in.

V = 904.3 cubic inches

Chapter 2, Practice Set 1

Calculate the perimeter for each figure and write your answer in the corresponding numbered space below. Include the unit of measure.

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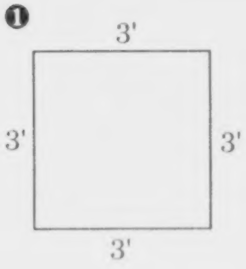

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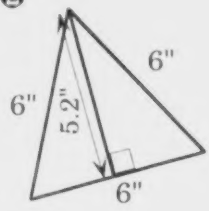

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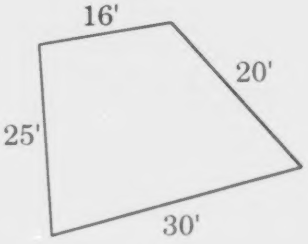

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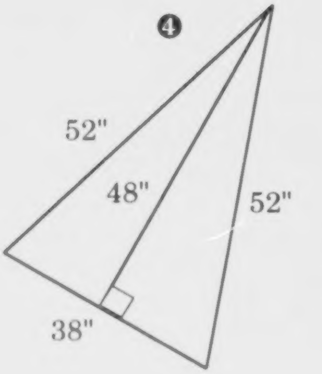

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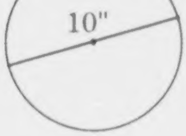

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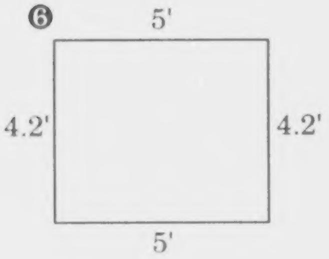

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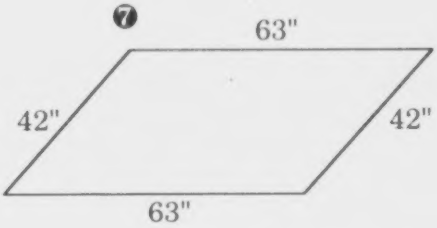

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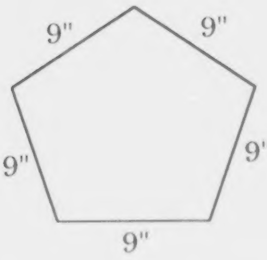

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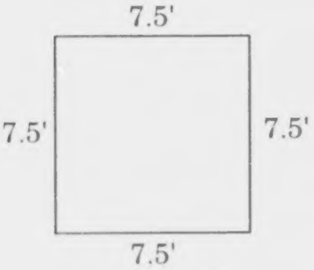

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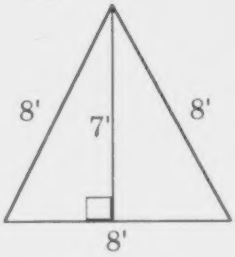

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Chapter 2, Practice Set 1 *(page two)*

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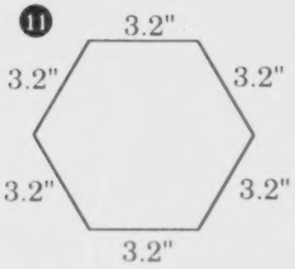
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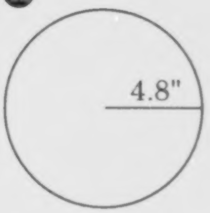

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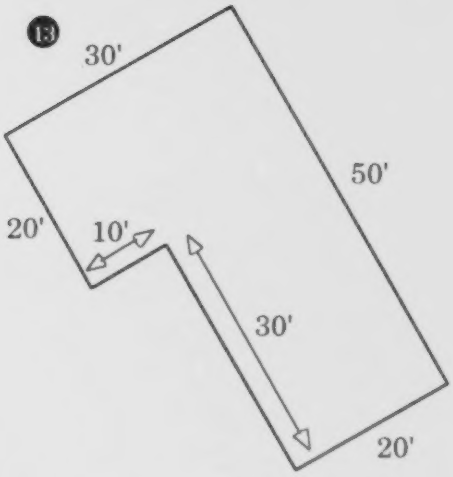
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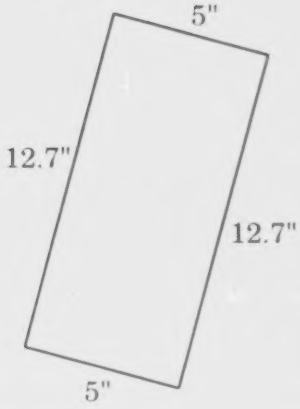

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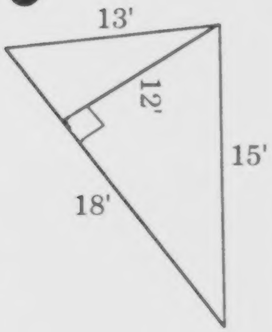

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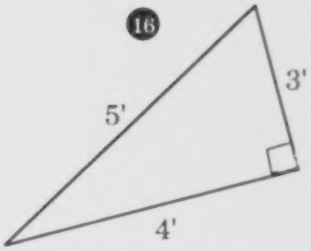

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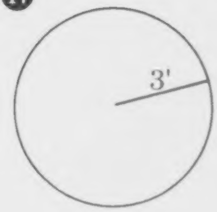

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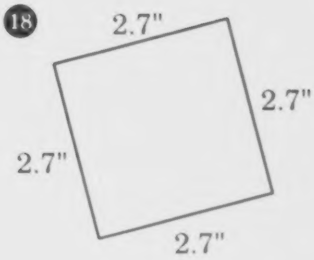

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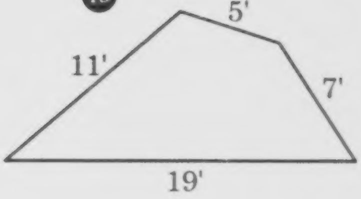

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Chapter 2, Practice Set 2

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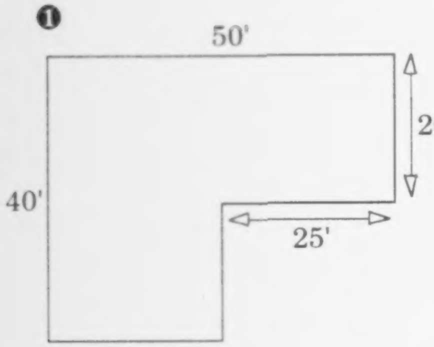

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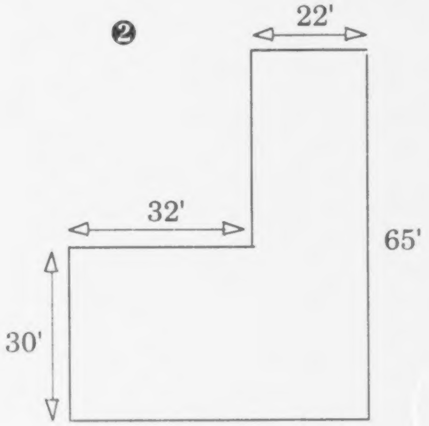

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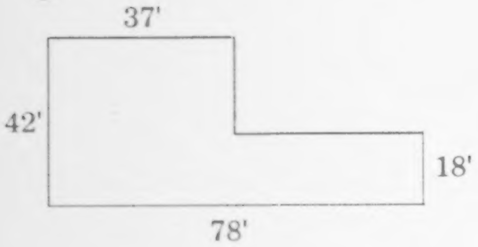

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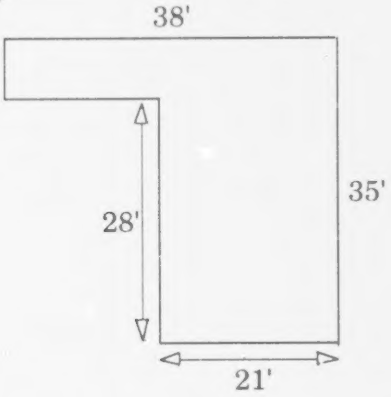

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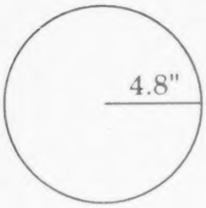

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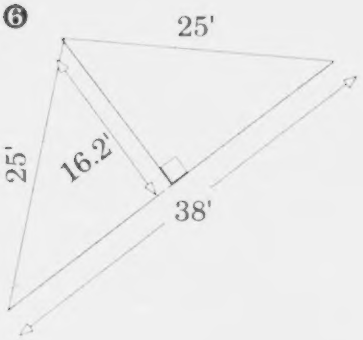

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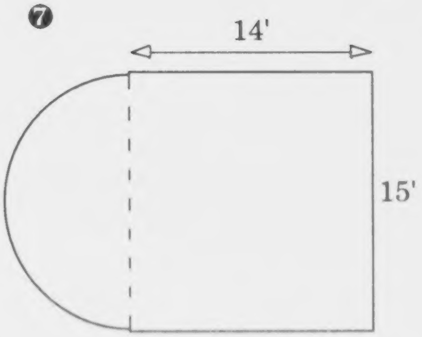

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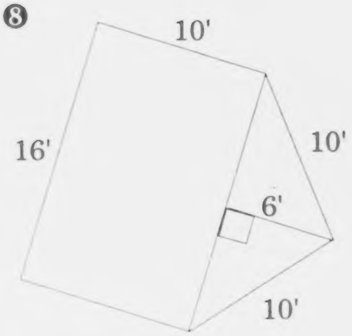

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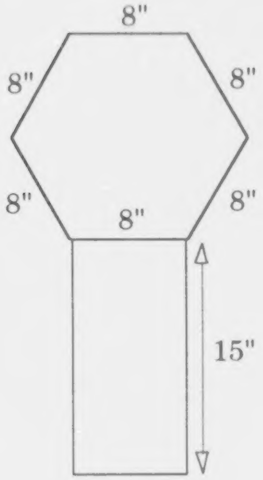

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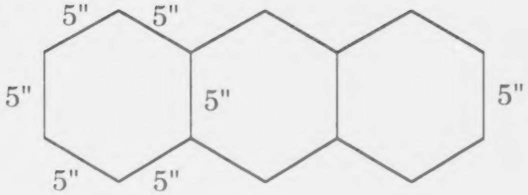

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Chapter 2, Practice Set 3

Calculate the area for each figure and write your answer in the corresponding numbered space below. Include the unit of measure.

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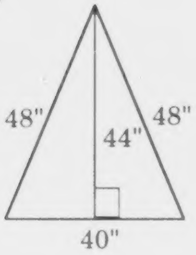

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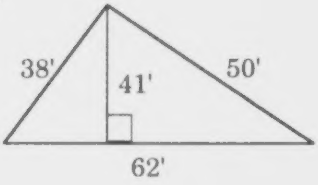

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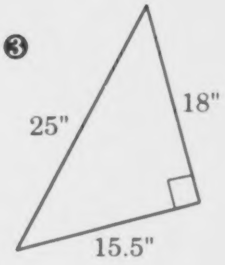

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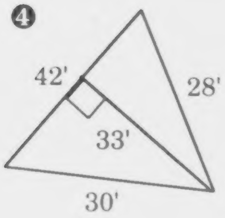

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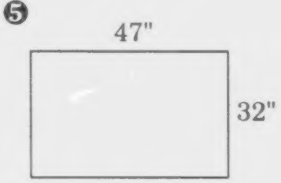

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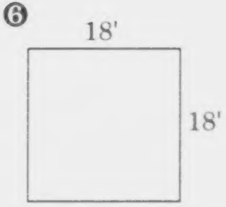

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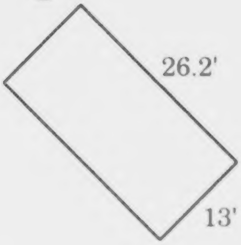

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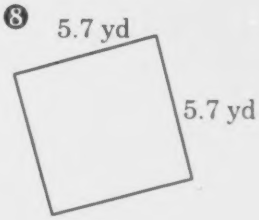

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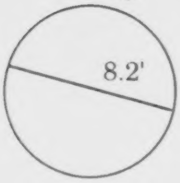
Chapter 2, Practice Set 3 *(page two)*

⑨



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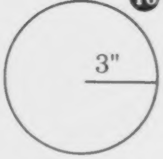

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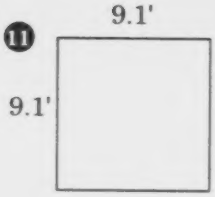

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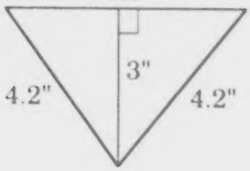

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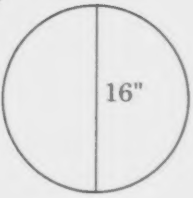

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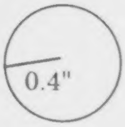

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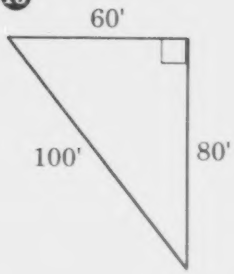

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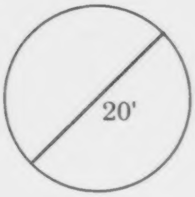

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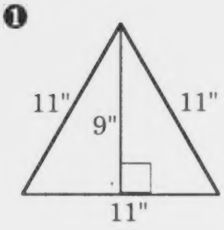
Chapter 2, Practice Set 4

Find the **perimeter** and **area** for each figure and write your answers in the corresponding numbered spaces. Include the unit of measure.

❶



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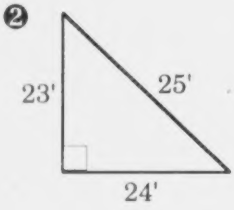

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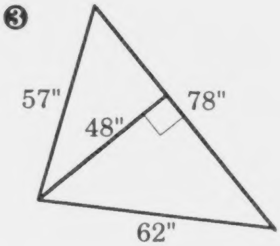

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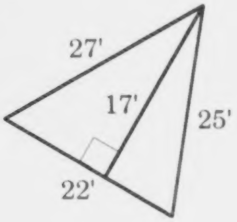

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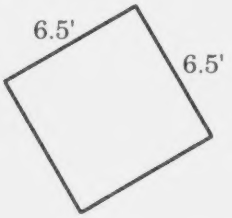

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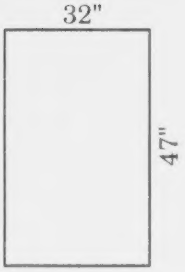

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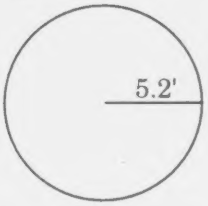

	perimeter	area
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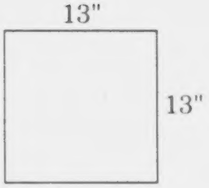
⑧



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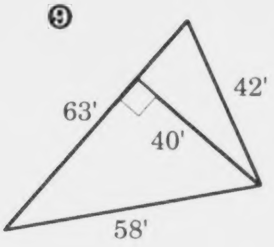

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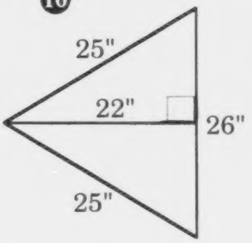

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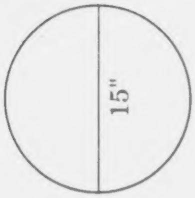

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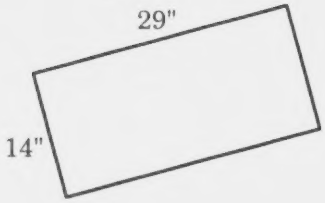

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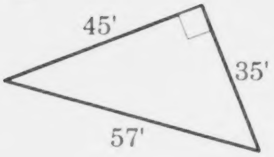

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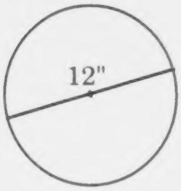

	perimeter	area
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9		
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11		
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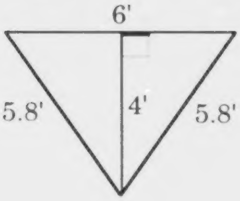
13		
14		

(continued)

Chapter 2, Practice Set 4 *(page three)*

15



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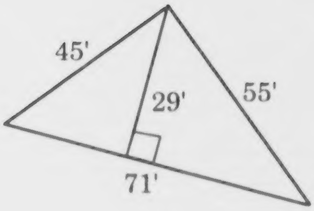

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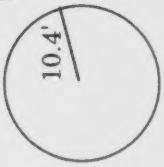

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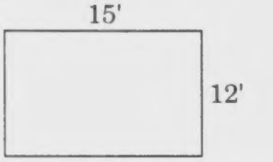

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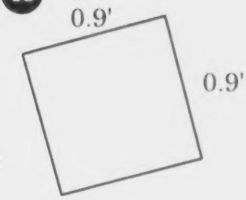

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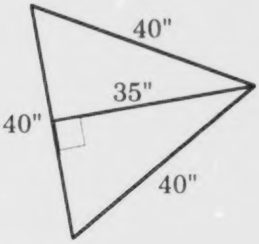

	perimeter	area
15		
16		
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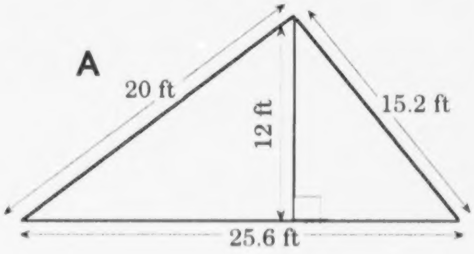
Chapter 2, Practice Set 5

Solve each of the following problems and write the answer below in the blank of the same number.

1. The diameter of a circular marigold garden is 10.7 yards. What is the radius?



2. Find the perimeter of triangle **A**.

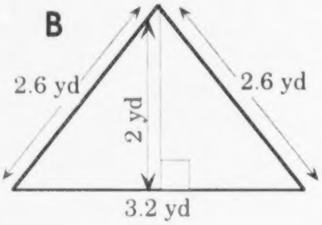
3. Find the area of triangle **A**.

4. Find the area of a circular coleus garden with a radius of 32 inches.

5. Find the perimeter of a rectangular vegetable garden with sides that measure 5.2 feet and 6.8 feet.

6. Find the area of a square geranium plot with one side that measures 6.25 feet.

7. Find the area of triangle B.



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(continued)

8. Find the perimeter of a circular rose garden with a diameter of 2.5 feet.

9. Find the area of a rectangular petunia garden with sides that measure 5.75 feet and 3 feet.

10. Find the perimeter of a square lily pond with one side that measures 5.8 yards.

- Answer questions 11-14 with reference to diagram **C**.

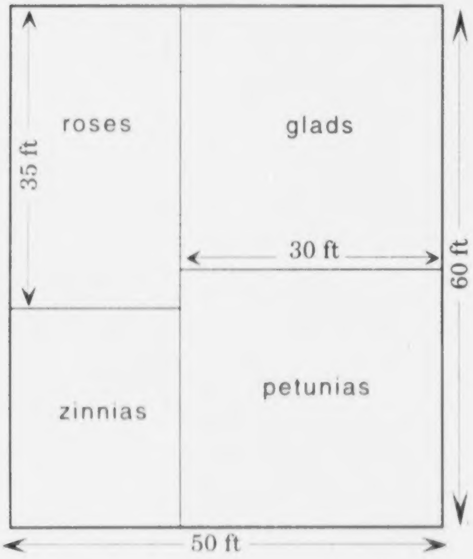
11. How much fencing is needed to surround the rose garden?

12. How much fencing is needed to surround the glads and the petunias as one garden?

13. How much fencing is needed to surround the zinnia garden?

14. What is the perimeter of the entire garden?

C



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Chapter 2, Practice Set 6

Solve each of the following problems and write the answer below in the blank of the same number.

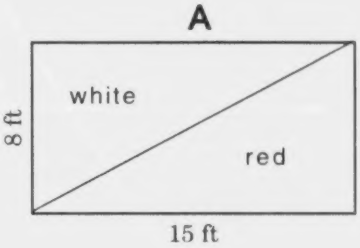
1. Aaron has a square petunia garden that measures 5 ¼ feet on a side. What is the area of his garden?

2. How much fencing will Aaron need to enclose his petunia garden? (See #1)

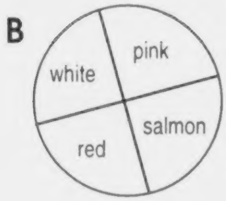
3. The local garden club plans to plant a circular garden in the town square next spring. The diameter of the proposed garden is 8 feet. What is its perimeter?

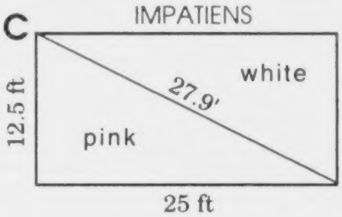
4. The park commission is planning a garden in Central Park (**A**). How much area should they allow for the red section?

5. If the entire garden in Central Park (**A**) is edged in blue ageratum, how many feet of ageratum will there be?



6. The diameter of the geranium bed in diagram **B** is 20 feet. How much area is allowed for the salmon geraniums?





7. Find the area of the impatiens bed in diagram **C**.

8. What is the perimeter of the section of pink impatiens in diagram **C**?

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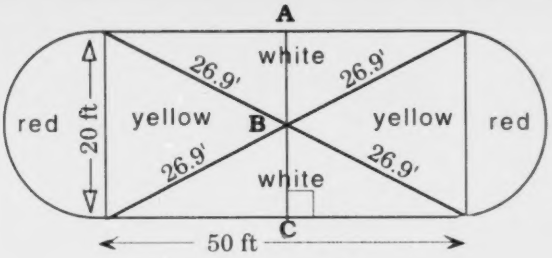
(continued)

- For questions 9-12, refer to diagram **D**.

AB = BC = 10 feet

D


A
white
26.9'
26.9'
red
20 ft
yellow
B
yellow
red
26.9'
26.9'
white
C
50 ft

9. Find the perimeter of the entire display. 9 ____________

10. Find the combined area of the two red sections. 10 ____________

11. How much area is allowed for the white sections combined? 11 ____________

12. Find the perimeter of one of the yellow sections. 12 ____________

- Referring to the greenhouse floor plan in diagram **E**, find the following measurements (#13-17):

13. perimeter of the entire greenhouse 13 ____________

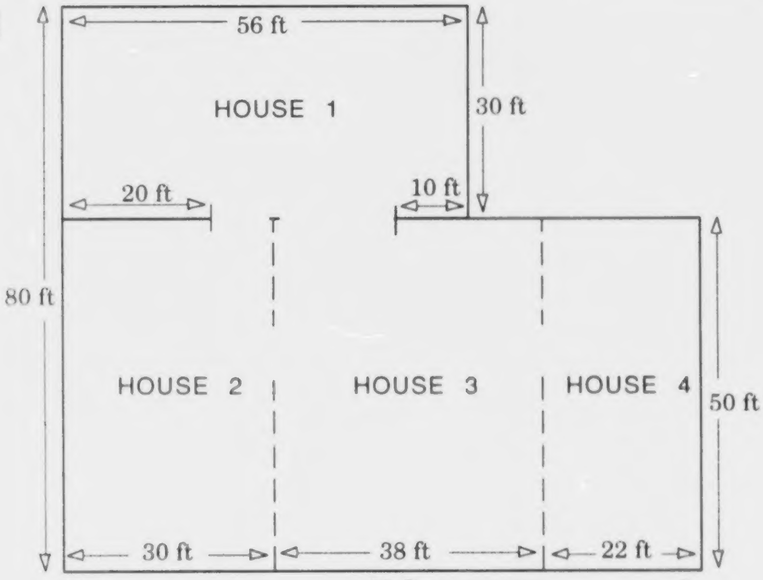
14. perimeter of house 1 14 ____________

15. area of house 2 15 ____________

16. combined area of houses 3 and 4 16 ____________

17. total area of the greenhouse 17 ____________

E


56 ft
HOUSE 1
30 ft
20 ft
10 ft
80 ft
HOUSE 2
HOUSE 3
HOUSE 4
50 ft
30 ft
38 ft
22 ft
90 ft

Chapter 2, Practice Set 7

Find how many cubic inches of soil will be needed to fill each of these containers completely. Write the answer below in the blank of the same number. (Use 3.14 for π and round answers to two decimal places.)

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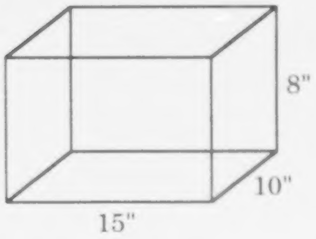

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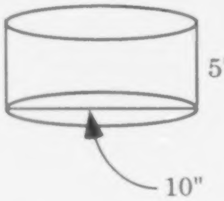

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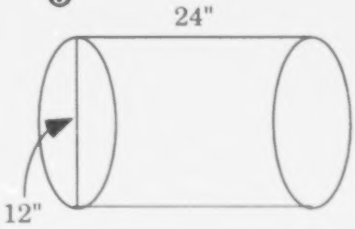

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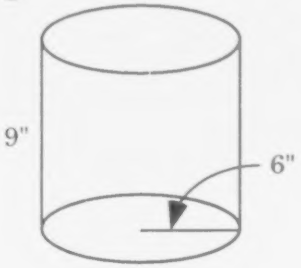

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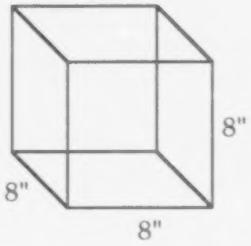

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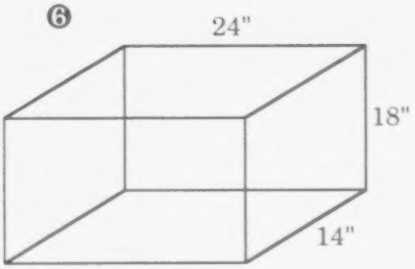

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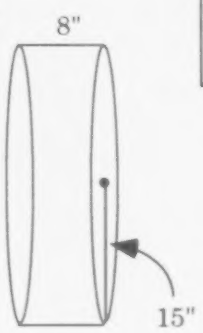

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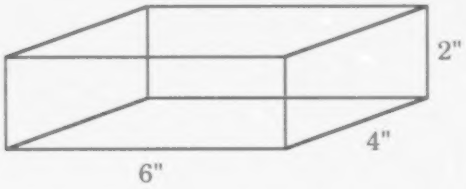

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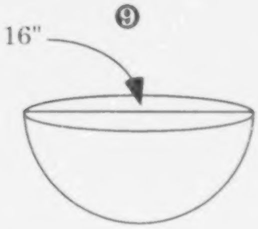
(continued)

Chapter 2, Practice Set 7 *(page two)*

Find how many cubic inches of soil will be needed to fill each of these containers completely.

(continued)

⑨



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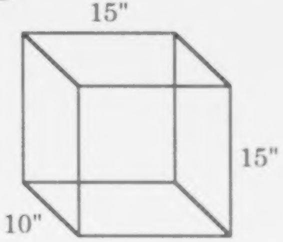

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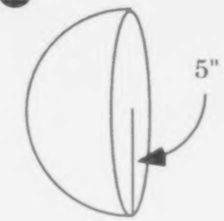

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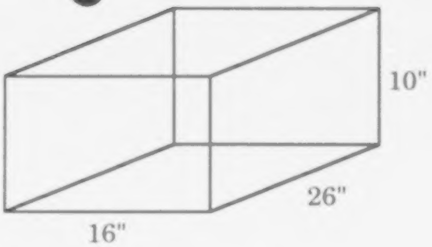

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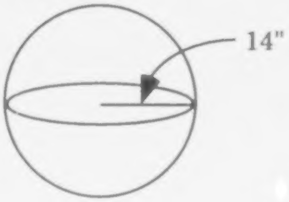

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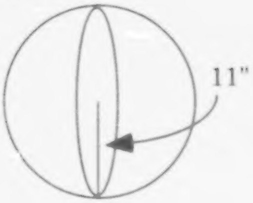

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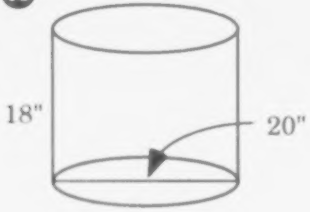

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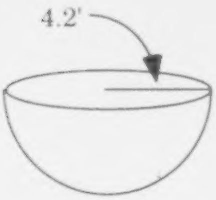
Chapter 2, Practice Set 8

Find how many **cubic feet** of soil will be needed to fill each of these containers completely. Write your answer on the line below each container. (Use 3.14 for π.)

❶



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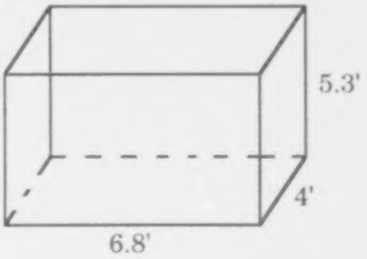

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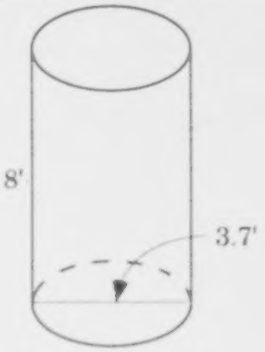

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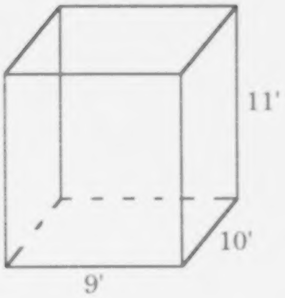

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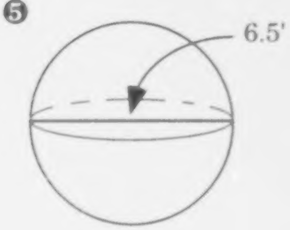

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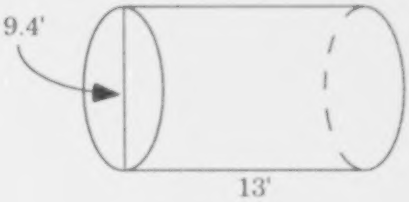

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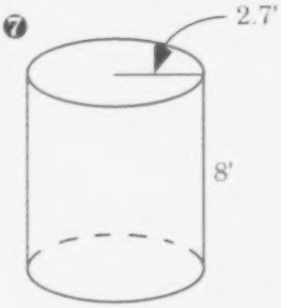

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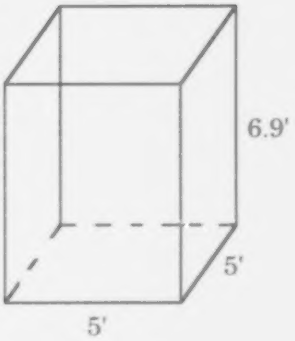

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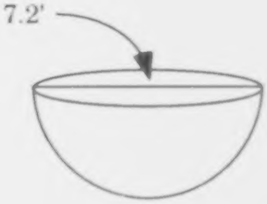

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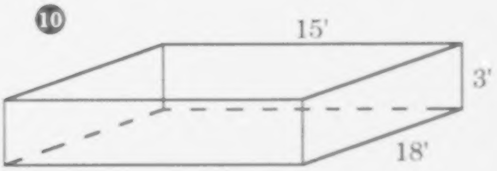

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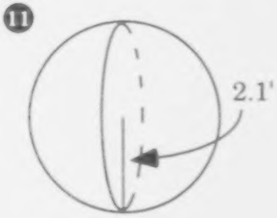

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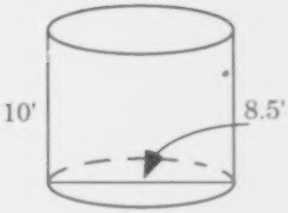
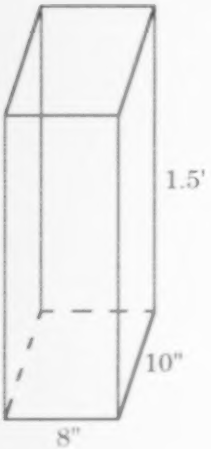


Chapter 2, Practice Set 9

Find the amount of soil needed to fill each of these containers completely. Write your answers below in **cubic inches and cubic feet** in the blanks of the same number. (Use 3.14 for π and round answers to two decimal places.)

❶



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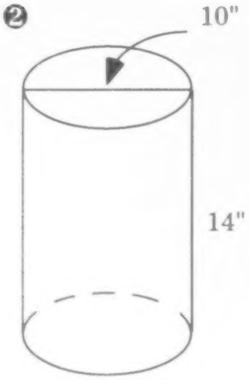

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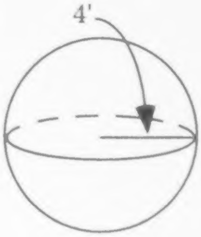

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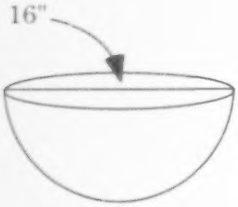

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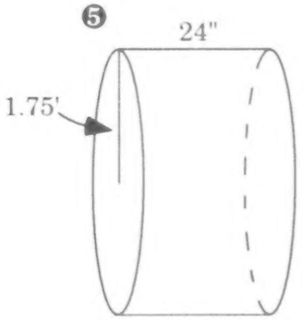

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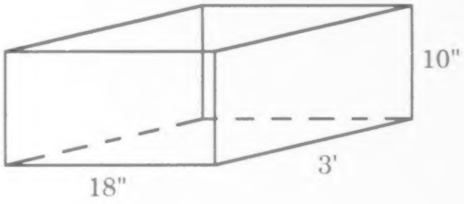


cubic inches cubic feet

1 ____________________ ____________________

2 ____________________ ____________________

3 ____________________ ____________________

4 ____________________ ____________________

5 ____________________ ____________________

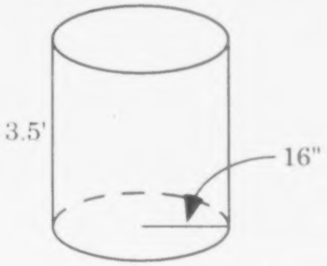
6 ____________________ ____________________

(continued)

Chapter 2, Practice Set 9 *(page two)*

Find the amount of soil needed to fill each of these containers completely. *(continued)*

❼



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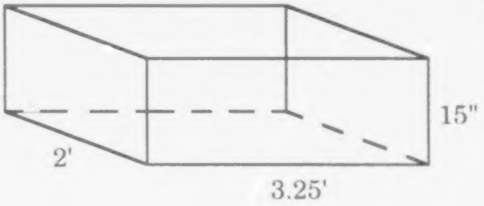

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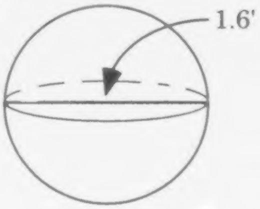

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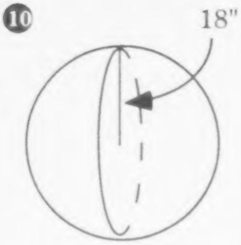

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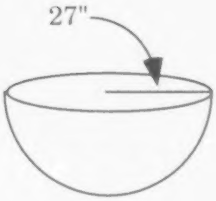

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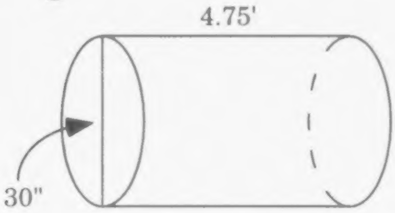


	cubic inches	cubic feet
7		
8		
9		
10		
11		
12		

Chapter 2, Practice Set 10

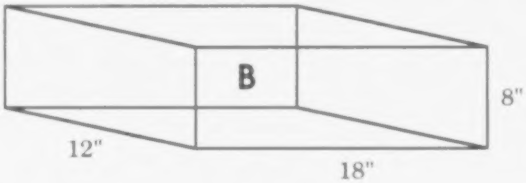
Answer each of the following questions in the spaces below. Include the unit of measure. (Use 3.14 for π and round answers to two decimal places.)

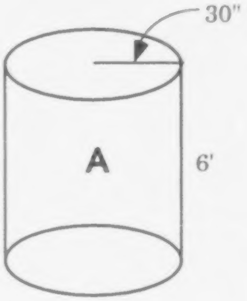
1. How much super-mix is needed to fill completely a rectangular flat that measures 9 inches by 12 inches by 3 inches deep?

2. How much super-mix would be needed to fill completely 36 flats like the one described in #1?

3. How many bags of super-mix would be needed to fill these 36 flats if each bag of super-mix contains 10 cubic feet of soil?

4. How much water will tank **A** hold? Give your answer in cubic feet.

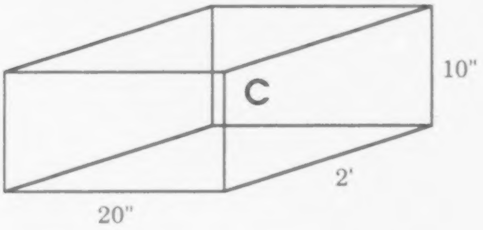


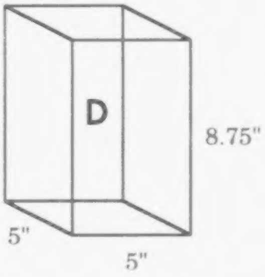


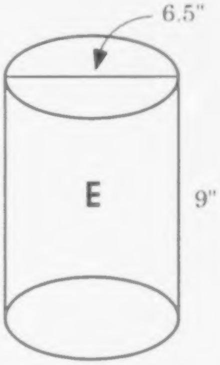
5. How much sand is needed to fill flat **B** completely?

6. How many cubic feet of sand would be needed to fill completely 50 flats like flat **B**?

7. How many cubic feet of germinating mix will be needed for 125 flats like flat **C** if each flat is filled one-half full?







8. Rapid-start is a germinating mix sold in 8-cubic-foot bags. How many bags of Rapid-start should be ordered to fill 1500 containers like container **D**?

9. 2300 planters like planter **E** will be produced for the spring sale. How many bags of super-grow potting soil will you need if each bag contains 12 cubic feet?

1 ______________________

2 ______________________

3 ______________________

4 ______________________

5 ______________________

6 ______________________

7 ______________________

8 ______________________

9 ______________________

CHAPTER 3

SALES

By the end of this chapter, you will be able to

1) write a sales slip, extending all amounts and finding the total amount of the sale, including sales tax.
2) determine the discount(s) applicable to an item on sale.
3) calculate mark-up on an item.
4) make a deposit, write a check, and reconcile a checking account.

* * * * * * * * * * * * * * *

Everyone who is part of the sales force in the horticulture industry must be able to write a sales slip. This will put to use all the basic arithmetic you have learned in the first years of schooling. In the following exercises, you will be shown two methods, both of which you will probably need to use as a sales clerk, whatever sector of the industry you work in.

The first method is strictly the pencil and paper method, that is, working the arithmetic out on paper or doing calculations "in your head" (mentally). The second method is using a calculator - the easier method for most of us. However, it is important not to neglect the mental calculation method just because it seems harder. A customer will often ask you as the sales clerk "how much" or "how many" when you are working the floor with no calculator handy. You can not say, "Just a minute, please" and rush to the counter to get your calculator! You will find it is a good sales practice to carry a pencil and a small pad of paper just for such occasions.

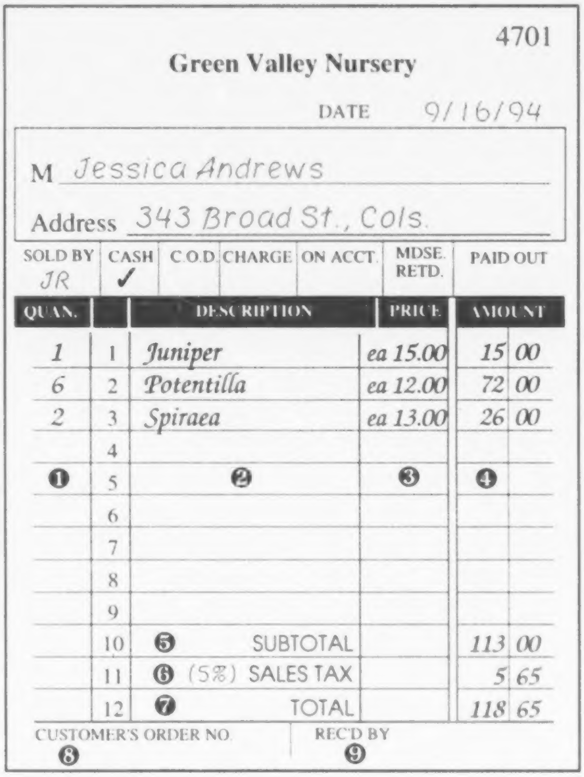
Of course, if there is a calculator close by, use it for your computation. Don't keep a customer waiting needlessly while you use paper and pencil.

Sales Slip, Statement, Invoice

Figure 3-1 shows a typical sales slip that has been completed. First, note that all needed information has been filled in carefully at the top of the slip. This is important information for the sales clerk or the bookkeeper to refer to at a later time. When you fill in these lines, print if your handwriting is poor.

When you have looked over the sales slip, you will readily see that addition, subtraction, multiplication, decimals, and percentages are all used to complete the sales slip. Division is often necessary as well.

Figure 3-1



4701

Green Valley Nursery

DATE 9/16/94

M Jessica Andrews

Address 343 Broad St., Cols.

SOLD BY	CASH	C.O.D.	CHARGE	ON ACCT.	MDSE. RETD.	PAID OUT
JR	✓					

QUAN.		DESCRIPTION	PRICE	AMOUNT	
1	1	Juniper	ea 15.00	15	00
6	2	Potentilla	ea 12.00	72	00
2	3	Spiraea	ea 13.00	26	00
	4				
①	5	②	③	④	
	6				
	7				
	8				
	9				
	10	⑤ SUBTOTAL		113	00
	11	⑥ (5%) SALES TAX		5	65
	12	⑦ TOTAL		118	65

CUSTOMER'S ORDER NO.	REC'D BY
⑧	⑨

The parts of the slip shown in Figure 3-1 are:

1. **Quantity** - number of items purchased
2. **Description** - listing or description of what is purchased
3. **Price** - price per item or unit given in decimal form
4. **Amount** = column 1 x column 3

   Example in line 2:
   6 Potentilla at $12.00 each 6 x 12.00 = 72.00
   (dollar signs are not written on sales slips)

5. **Subtotal** - the sum of all the figures above it
6. **Sales tax** (state) - calculated by multiplying the rate of tax in decimal form by the subtotal.
7. **Total** - the amount the customer owes - the subtotal plus sales tax.
8. **Customer's order number** - fill in if the business keeps track of these.
9. **Received by** - the customer's signature, which is needed for charge or on-account sales.

Sales Tax

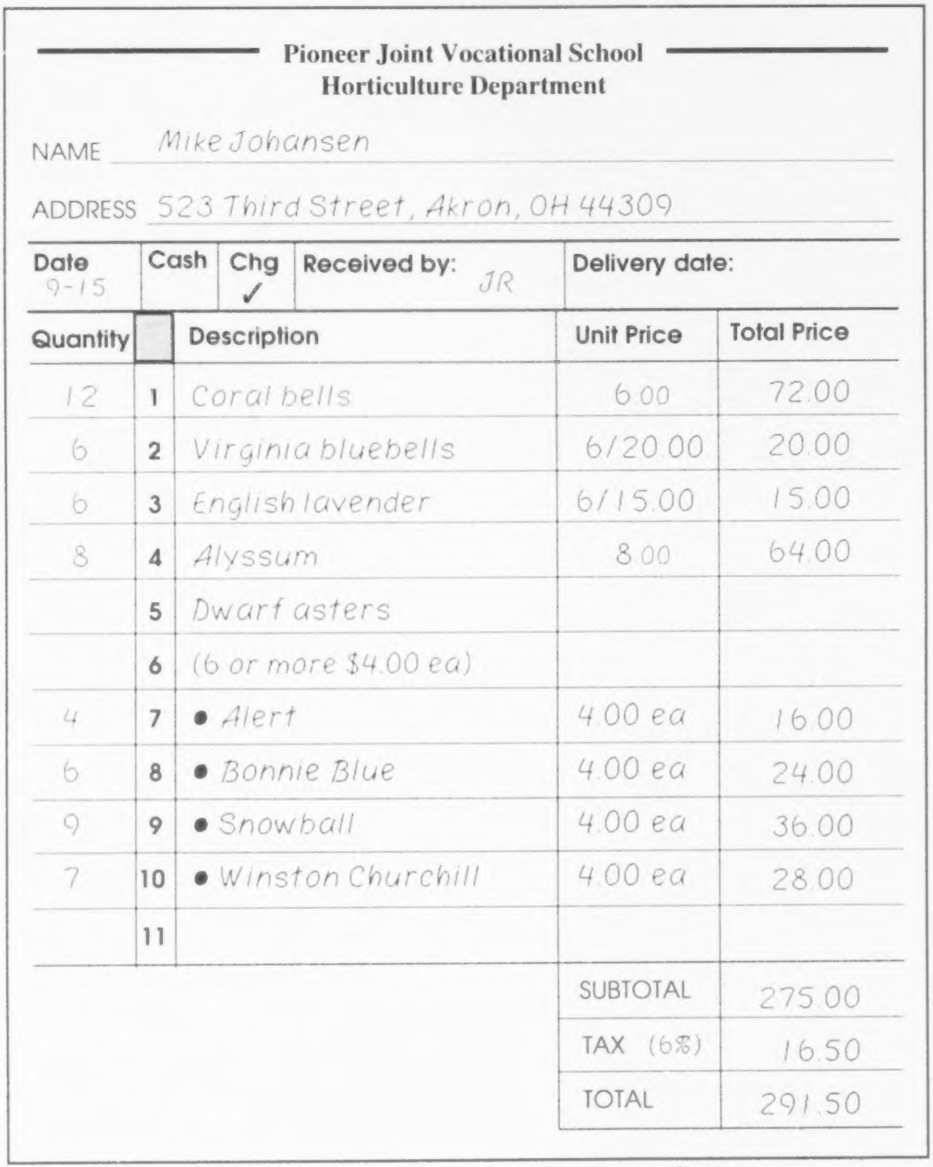
Just a note about calculating sales tax. The rate of sales tax is always given as a percent (like 5%, 7% or 12%). Before you can complete any calculation, you must first change the percent to its decimal equivalent. How is this done? A percent must be written as a two-digit number to the **right** of the decimal point.

Examples →

12% becomes .12
15% becomes .15
7%, with only one digit, must add 0 as a place holder in front of it; it becomes .07

5% becomes .05
8% becomes .08
4% becomes .04

Now let's follow the explanation on the next page for this sales slip (Figure 3-2).



Pioneer Joint Vocational School
Horticulture Department

NAME Mike Johansen

ADDRESS 523 Third Street, Akron, OH 44309

Date	Cash	Chg	Received by:	Delivery date:
9-15		✓	JR	

Quantity		Description	Unit Price	Total Price
12	1	Coral bells	6.00	72.00
6	2	Virginia bluebells	6/20.00	20.00
6	3	English lavender	6/15.00	15.00
8	4	Alyssum	8.00	64.00
	5	Dwarf asters		
	6	(6 or more $4.00 ea)		
4	7	• Alert	4.00 ea	16.00
6	8	• Bonnie Blue	4.00 ea	24.00
9	9	• Snowball	4.00 ea	36.00
7	10	• Winston Churchill	4.00 ea	28.00
	11			
			SUBTOTAL	275.00
			TAX (6%)	16.50
			TOTAL	291.50

Figure 3-2

line 1 - 12 items (or 1 dozen); the total price 72.00

line 2 - the unit price is for 6 items; the total price 20.00

line 3 - the unit price is for 6 items; the total price 15.00

line 4 - the unit price is 8; the total price is 64.00

lines 5 & 6 - each aster listed costs $4.00 because a total of 26 were purchased.

line 7 - the total price 16.00

line 8 - the total price 24.00

line 9 - the total price 36.00

line 10 - the total price 28.00

Subtotal - 275.00

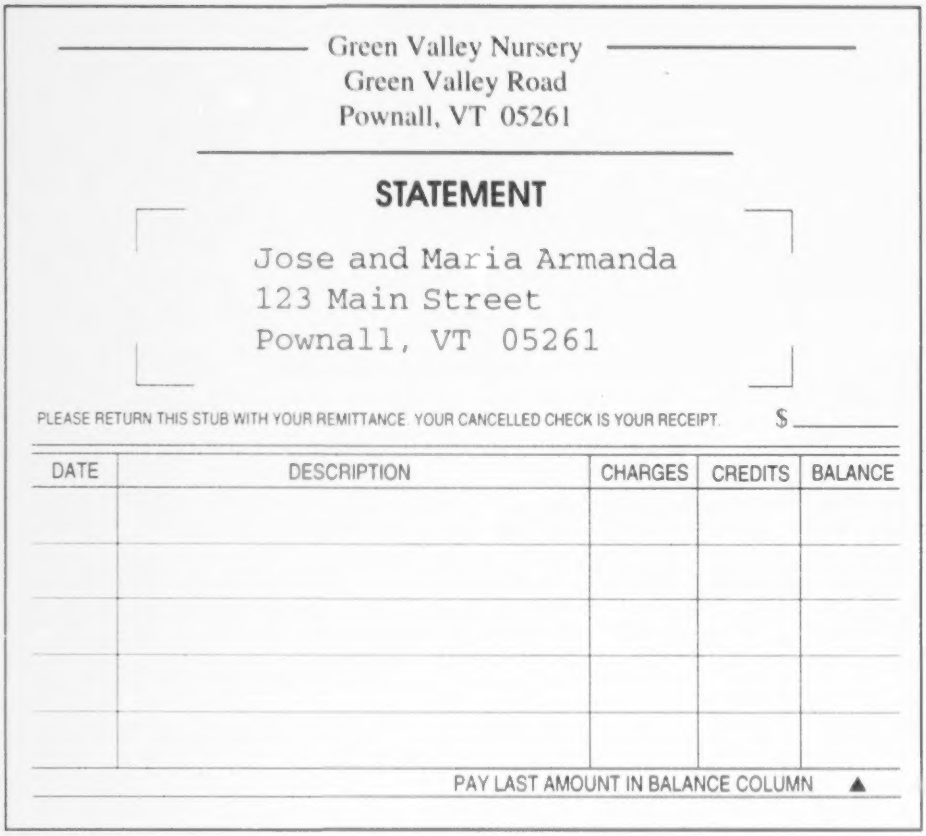
Sales tax - .06 x 275 = 16.50

Total - 291.50

You may have to work with other forms in addition to the sales slip, depending on what responsibilities go with your position. If the business has a charge account system, you may have to complete statements at the end of each month (Figure 3-3). The statement is a bill or reminder to the customer that payment is due.

. You may be responsible for checking invoices sent to the business before they are paid. An invoice is a bill sent to a business that buys merchandise for resale (Figure 3-4). Invoices should be checked carefully, because they often contain errors.

Figure 3-3



Green Valley Nursery
Green Valley Road
Pownall, VT 05261

STATEMENT

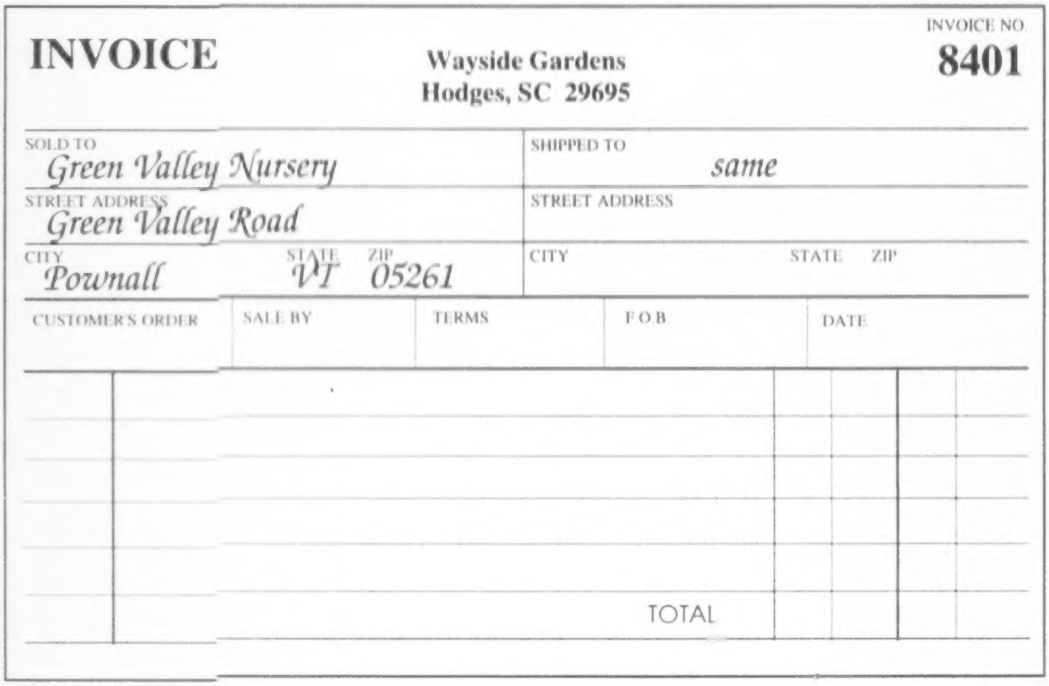
Jose and Maria Armanda
123 Main Street
Pownall, VT 05261

PLEASE RETURN THIS STUB WITH YOUR REMITTANCE. YOUR CANCELLED CHECK IS YOUR RECEIPT. $______

DATE	DESCRIPTION	CHARGES	CREDITS	BALANCE

PAY LAST AMOUNT IN BALANCE COLUMN ▲

Figure 3-4



INVOICE

Wayside Gardens
Hodges, SC 29695

INVOICE NO.
8401

SOLD TO *Green Valley Nursery*
SHIPPED TO *same*
STREET ADDRESS *Green Valley Road*
STREET ADDRESS
CITY *Pownall* STATE *VT* ZIP *05261*
CITY STATE ZIP

CUSTOMER'S ORDER	SALE BY	TERMS	F.O.B.	DATE

	TOTAL				

Checking Accounts

Many people use a personal checking account to make purchases and pay bills. As customers in various horticulture businesses, they often write checks for payment of purchases. Therefore, it is important that every salesperson be able to recognize a correctly written check. For you personally, it is just as important that you learn to keep a checkbook register and that you are able to reconcile your own account at the end of each month or cycle.

The following banking terms are ones you should understand when dealing with checking accounts.

check - legal document that is used as money. Safer than cash. Provides a record or receipt for payment of a bill or purchase of a product or service.

deposit - putting money into checking account

balance - amount of money in checking account

currency - paper money (like dollar bills)

service charge - fee that many banks charge for processing checks

bank statement - bank form sent to the owner of the account listing all checks cashed and all deposits credited to the account for a certain period (usually one month)

check register - ledger that the customer keeps of checks written and deposits made

canceled check - a check offered in payment and processed ("cashed") by the bank; amount of check appears on the bank statement.

"bounced" check - check that was not "good" (not processed by the bank) because there was not enough money in the account to cover it

outstanding check - a check that was written but was not processed by the bank; the amount does not appear on bank statement.

outstanding deposit - a deposit that was made but does not appear on the bank statement

reconciling - the process of determining whether the balance on your check register agrees with the balance the bank shows for your account on its statement.

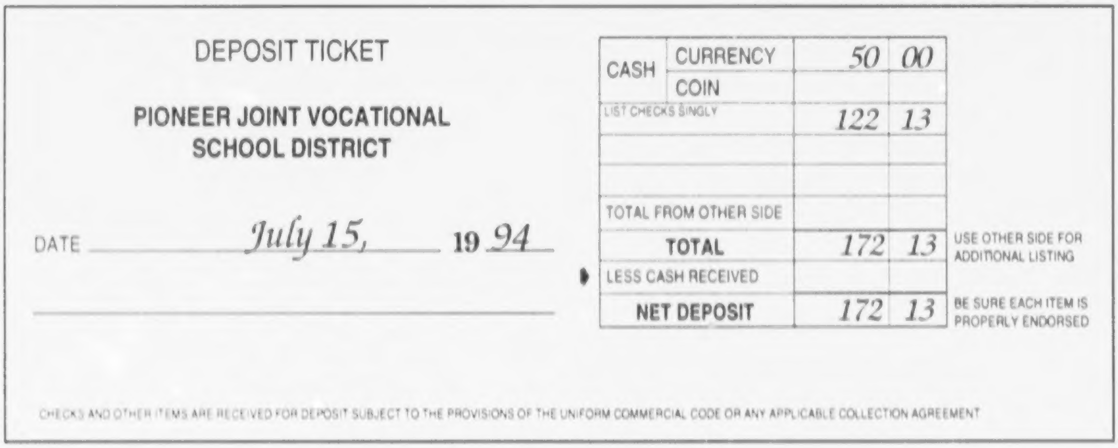
Making a Deposit

Whenever you put money into your checking account, you must fill out a deposit slip (ticket) like the one shown in Figure 3-5. In this sample, notice that there are two deposits made: $50.00 in cash and a check for $122.13. The total deposit is $172.13.

Every time you make a deposit or write a check you should record the transaction in your check register, the ledger that is provided with your checks. A sample page from a check register is shown in Figure 3-6.

Notice that the total deposit shown in Figure 3-5 has been recorded in this register. The date is filled in and the new balance has been calculated: $863.72.

Figure 3-5



DEPOSIT TICKET

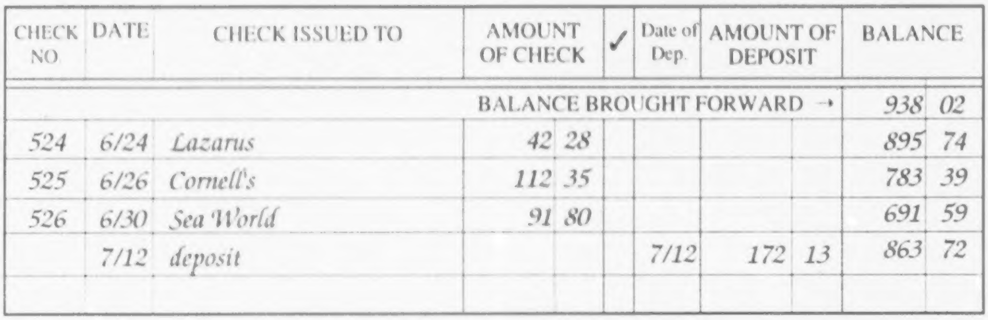
PIONEER JOINT VOCATIONAL SCHOOL DISTRICT

DATE *July 15,* 19 *94*

CASH	CURRENCY	*50*	*00*	
	COIN			
LIST CHECKS SINGLY		*122*	*13*	
TOTAL FROM OTHER SIDE				
TOTAL		*172*	*13*	USE OTHER SIDE FOR ADDITIONAL LISTING
LESS CASH RECEIVED				
NET DEPOSIT		*172*	*13*	BE SURE EACH ITEM IS PROPERLY ENDORSED

CHECKS AND OTHER ITEMS ARE RECEIVED FOR DEPOSIT SUBJECT TO THE PROVISIONS OF THE UNIFORM COMMERCIAL CODE OR ANY APPLICABLE COLLECTION AGREEMENT

Figure 3-6

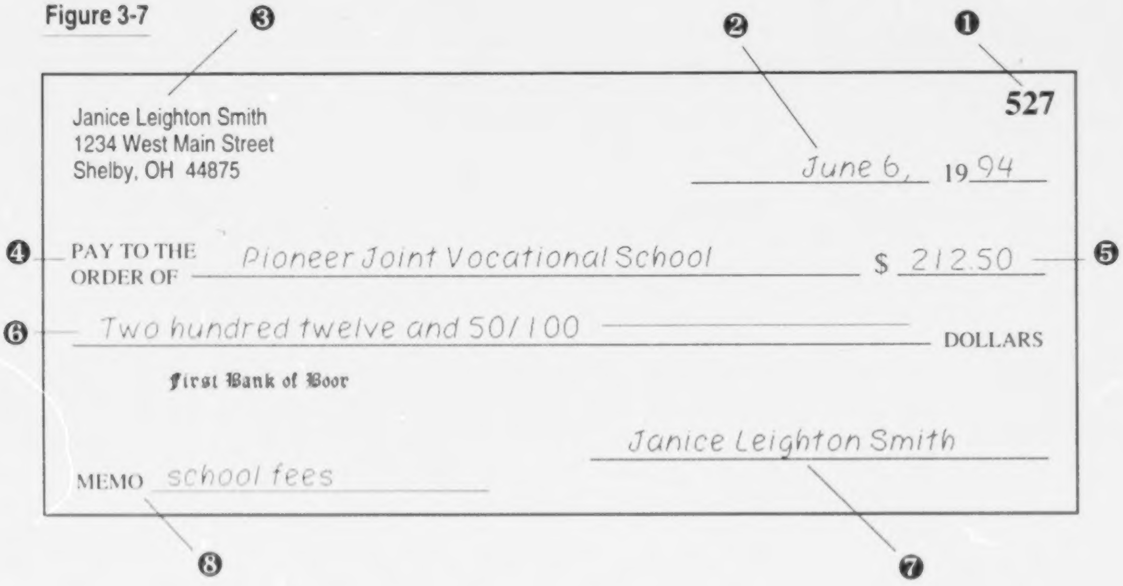


CHECK NO.	DATE	CHECK ISSUED TO	AMOUNT OF CHECK		✓	Date of Dep.	AMOUNT OF DEPOSIT		BALANCE	
			BALANCE BROUGHT FORWARD →						*938*	*02*
524	*6/24*	*Lazarus*	*42*	*28*					*895*	*74*
525	*6/26*	*Cornell's*	*112*	*35*					*783*	*39*
526	*6/30*	*Sea World*	*91*	*80*					*691*	*59*
	7/12	*deposit*				*7/12*	*172*	*13*	*863*	*72*

Writing a Check

A check is used to withdraw money from a checking account. Look over the different parts of a check as shown in Figure 3-7.

Figure 3-7



527

Janice Leighton Smith
1234 West Main Street
Shelby, OH 44875

June 6, 19 94

PAY TO THE ORDER OF Pioneer Joint Vocational School $ 212.50

Two hundred twelve and 50/100 DOLLARS

First Bank of Boor

Janice Leighton Smith

MEMO school fees

1. check number - checks are consecutively numbered
2. date the check is written
3. imprinted name and address of checking account owner
4. *Pay to the order of* - name of person or company that is to receive the money
5. $ ________ - the amount of money to be paid, written in decimal form
6. line on which to write in words the amount of money to be paid
7. line for the signature of the check writer (account owner)
8. *Memo* - line for recording what was purchased with the check *(optional)*

Reconciling the Checking Account

At the end of each month (typically), the customer with a checking account receives by mail a packet from the bank. This packet contains the following:

1. the statement - a form that lists all the checks cashed and all the deposits credited to the account during that month

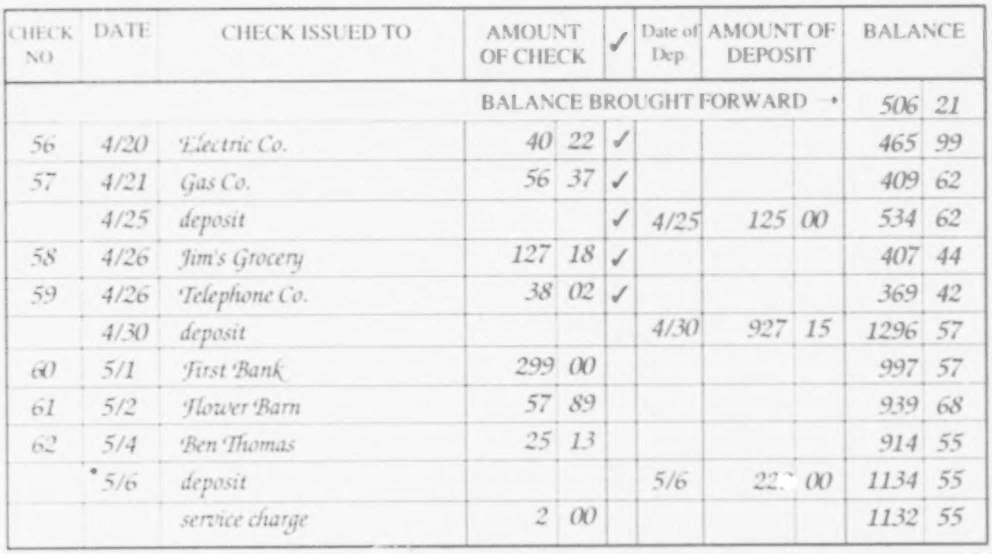
2. a form used to reconcile the account, including step-by-step directions (often on the back of the statement)

3. all canceled checks

With this packet and your check register, you will be ready to reconcile the account. It is important that you do so every month. First, you can be assured that the bank's figures for your account agree with your register's balance, and you know what that balance is. Second, if an error occurs, finding it will be easier if you are dealing with one month's transactions only. Either you or the bank can make a mistake.

To complete the reconciliation of a checking account, set out your checkbook register, the bank statement, the reconciling form, and a calculator. Using the sample account on the next page (Figure 3-8), follow the steps given on page 77 to reconcile the account. These directions are typical of ones you would receive in your monthly packet as a bank customer.

(continued)



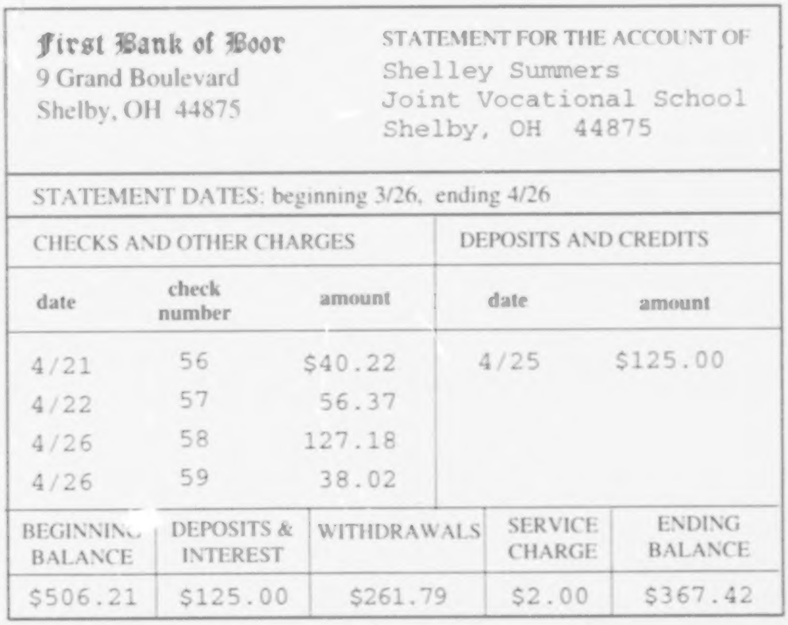
CHECK NO	DATE	CHECK ISSUED TO	AMOUNT OF CHECK		✓	Date of Dep	AMOUNT OF DEPOSIT		BALANCE	
						BALANCE BROUGHT FORWARD →			506	21
56	4/20	Electric Co.	40	22	✓				465	99
57	4/21	Gas Co.	56	37	✓				409	62
	4/25	deposit			✓	4/25	125	00	534	62
58	4/26	Jim's Grocery	127	18	✓				407	44
59	4/26	Telephone Co.	38	02	✓				369	42
	4/30	deposit				4/30	927	15	1296	57
60	5/1	First Bank	299	00					997	57
61	5/2	Flower Barn	57	89					939	68
62	5/4	Ben Thomas	25	13					914	55
	5/6	deposit				5/6	220	00	1134	55
		service charge	2	00					1132	55

A

Check register

B

Bank statement



First Bank of Boor
9 Grand Boulevard
Shelby, OH 44875

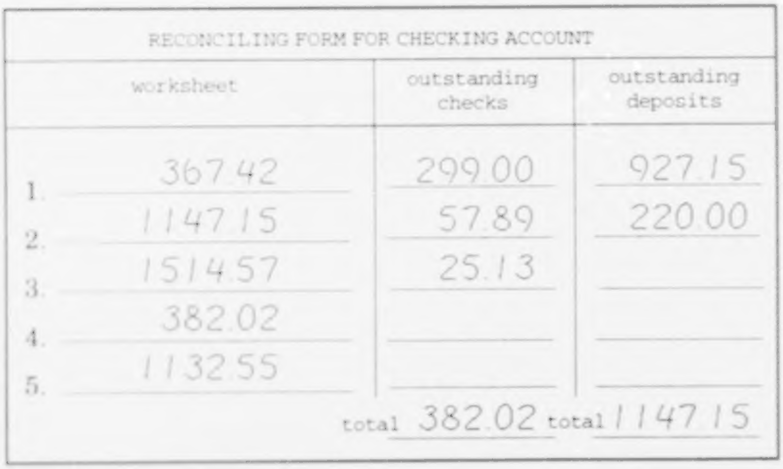
STATEMENT FOR THE ACCOUNT OF
Shelley Summers
Joint Vocational School
Shelby, OH 44875

STATEMENT DATES: beginning 3/26, ending 4/26

CHECKS AND OTHER CHARGES			DEPOSITS AND CREDITS	
date	check number	amount	date	amount
4/21	56	$40.22	4/25	$125.00
4/22	57	56.37		
4/26	58	127.18		
4/26	59	38.02		

BEGINNING BALANCE	DEPOSITS & INTEREST	WITHDRAWALS	SERVICE CHARGE	ENDING BALANCE
$506.21	$125.00	$261.79	$2.00	$367.42

Figure 3-8



RECONCILING FORM FOR CHECKING ACCOUNT

	worksheet	outstanding checks	outstanding deposits
1.	367.42	299.00	927.15
2.	1147.15	57.89	220.00
3.	1514.57	25.13	
4.	382.02		
5.	1132.55		
		total 382.02	total 1147.15

C

Reconciling form

1. If there is a service charge on the statement (B), write it in your register (A) and subtract it from the balance.

2. With a check mark (✓) in the column to the right of the amount of the check, mark off in your register all the checks listed on the statement.

3. Next mark off in the same column in your register all the deposits listed on the statement.

4. On the reconciling form provided by the bank (C), list all the **outstanding** check amounts – those that do not have a check mark beside them in your register. These are the checks that have not yet been processed by the bank and do not appear on the bank statement.

5. Next list on the reconciling form all the **outstanding** deposits – those that you listed on your register but that are not shown on the bank statement. You will have no check mark beside them in your register.

6. Now get the calculator handy (or use your math skills with pencil and paper) and complete the reconciling form with these steps:

   a. Enter the ending balance ($367.42) from the bank statement on line 1.

   b. Total the outstanding deposits in column 3 ($1147.15) and enter on line 2.

   c. Add line 1 and line 2 and write the total on line 3 ($1514.57).

   d. Total the outstanding checks in column 2 ($382.02) and enter on line 4.

   e. Subtract line 4 from line 3 and write the number ($1132.55) on line 5.

   f. Compare line 5 with the balance in your register. The amounts should be the same.

Discounts

In any business, customers who are interested in buying merchandise will ask what the price of that merchandise is. Many of them will ask next, "Do you ever give a discount?" On the other hand, you may be responsible for buying goods from a wholesale company. You find that the company offers a discount on the cost price of a certain item if you buy larger quantities. A discount simply means that you or the customer will not have to pay the full quoted price (the price on the tag, if you are the customer; the price in the catalog, if you are the business owner).

The discount rate is expressed as a percent. Remember, computations with percents are possible only after the percent has been changed to its decimal equivalent. These decimal equivalents must contain at least two decimal places (for example, 16% = .16 and 6% = .06).

There are two methods you could use for finding the discount and the sale price.

Method 1

1. Change the percent to its decimal equivalent.
2. To find the discount, multiply the tag price by the decimal equivalent.
3. Sale price = tag price – discount

Example 1

The tag price of a certain item of merchandise is $24.95. On this day the price is discounted 20%. Find the discount and the sale price of the item.

1. 20% = .20
2. discount $24.95 x .20 = $4.99
3. sale price $24.95 – $4.99 = $19.96

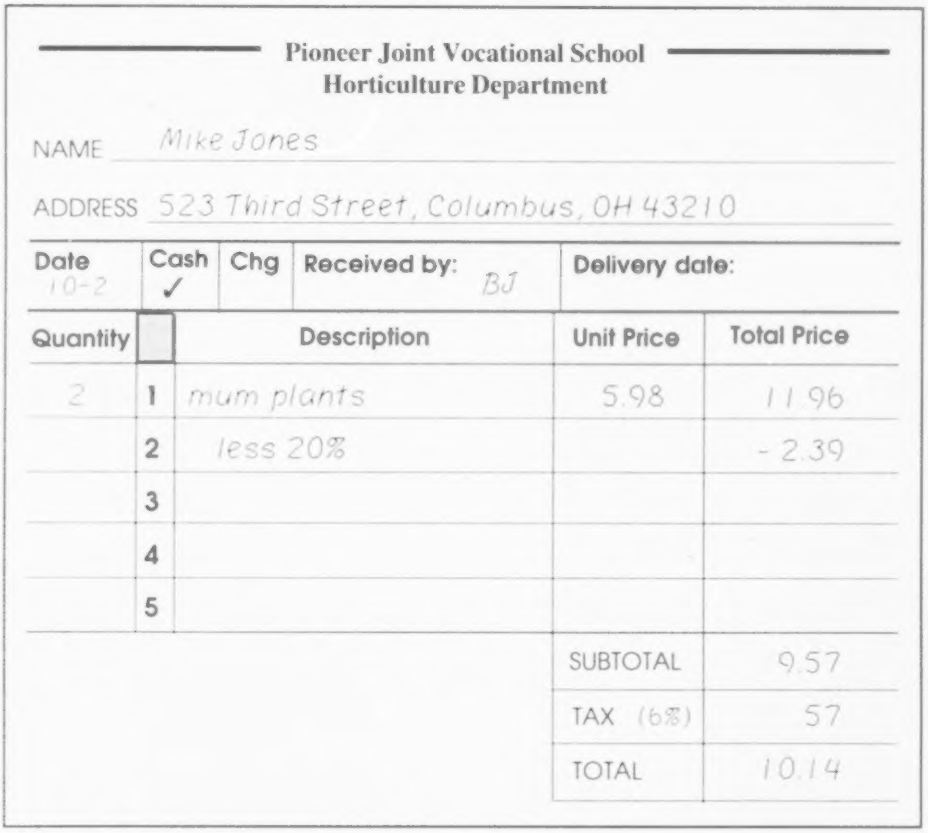
Example 2

A blue spruce regularly sells for $79.95. It is offered at a 25% discount. What is the sale price?

1. 25% = .25
2. discount $79.95 x .25 = $19.99 (rounded to nearest penny)
3. sale price $79.95 – $19.99 = $59.96

Discounts should be shown on sales slips. An example given in Figure 3-9 shows a 20% discount offered on mum plants that usually sell for $5.98 each. Notice that the sale price and a 6% sales tax are shown on the sales slip.

Figure 3-9



Pioneer Joint Vocational School
Horticulture Department

NAME Mike Jones

ADDRESS 523 Third Street, Columbus, OH 43210

Date	Cash	Chg	Received by:	Delivery date:
10-2	✓		BJ	

Quantity		Description	Unit Price	Total Price
2	1	mum plants	5.98	11.96
	2	less 20%		- 2.39
	3			
	4			
	5			
			SUBTOTAL	9.57
			TAX (6%)	57
			TOTAL	10.14

The other method for finding discounts and sale prices is as follows:

Method 2

1. *Think:* the new percent = 100% – discount rate
2. Sale price = new percent in decimal form x tag price

Now apply Method 2 to Example 1:

1. new percent 100% – 20% = 80% or .80
2. sale price .80 x $24.95 = $19.96

And to Example 2:

1. new percent 100% – 25% = 75% or .75
2. sale price .75 x $79.95 = $59.96

Either method gives you the same results.

Multiple Discounts

Sometimes a company offers a customer more than one discount on a purchase. This practice is called multiple discounts. Discounts can be offered for any number of reasons: buying large quantities of an item, paying cash for a purchase, buying an item that is being discontinued, or making a purchase of more than a certain sum of money.

The calculation of such discounts does not allow the percents to be added together. Instead, each discount must be applied separately as was done in the previous examples.

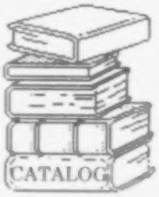
Example 3

A lawn bench, priced at $523.89, was just discounted 10%. Then an additional 4% discount is added for paying cash. If you pay with cash, what will the bench cost you after the discounts are applied? Use either of the methods discussed for finding these discounts.

Method 1	**Method 2**
Calculate the sale price for the first discount.	Calculate the sale price for the first discount.
1. 10% = .10	1. 100% – 10% = 90%
2. $523.89 x .10 = $52.39	2. .90 x $523.89 = $471.50
3. $523.89 – $52.39 = $471.50	
Calculate the sale price for the second discount using $471.50 as the tag price.	Calculate the sale price for the second discount using $471.50 as the tag price.
1. 4% = .04	1. 100% – 4% = 96%
2. $471.50 x .04 = $18.86	2. .96 x $471.50 = $452.64
3. $471.50 – $18.86 = $452.64	
The bench will cost you $452.64.	The bench will cost you $452.64.

Example 4

The company you work for is ordering equipment from a wholesale catalog. The list price for this equipment is $1236.52. Then you discover you are eligible for discounts of 12%, 8%, and 2%. How much will this equipment cost your company?



Method 1	**Method 2**
Calculate the sale price for the first discount.	Calculate the sale price for the first discount.
1. 12% = .12 2. $1236.52 x .12 = $148.38 3. $1236.52 – $148.38 = $1088.14	1. 100% – 12% = 88% 2. .88 x $1236.52 = $1088.14
Calculate the sale price for the second discount using $1088.14 as the tag price.	Calculate the sale price for the second discount using $1088.14 as the tag price.
1. 8% = .08 2. $1088.14 x .08 = $87.05 3. $1088.14 – $87.05 = $1001.09	1. 100% – 8% = 92% 2. .92 x $1088.14 = $1001.09
Calculate the sale price for the third discount using $1001.09 as the tag price.	Calculate the sale price for the third discount using $1001.09 as the tag price.
1. 2% = .02 2. $1001.09 x .02 = $20.02 3. $1001.09 – $20.02 = $981.07	1. 100% – 2% = 98% 2. .98 x $1001.09 = $981.07
The amount your company owes the wholesaler is $981.07.	The amount your company owes the wholesaler is $981.07.

Mark-up and Pricing

To understand a discussion of mark-up and pricing, you need to learn the meaning of the following terms:

- retail business - a business that buys items from a wholesale distributor for resale to the public
- wholesale price - the price a business pays for an item that will be resold to the public
- retail price - the price the public pays for an item

Mark-up, as used in the retail business, is the amount the individual business owner adds to the wholesale price of merchandise or services in order to make a profit. It is expressed as a percent. This profit is often essential for the small business owner to continue operations and to pay personal bills and buy food, clothing, and other needed items.

When a business receives merchandise, it must be priced before it is put out for sale. The owner decides what percentage of profit must be made on each item. The decision is made either from experience or from estimating what must be cleared to stay in business.

For example, the wholesale price of a certain item is $5.00. The owner feels $2.00 must be cleared on the item to stay in business. So the owner sets the selling price of the item at $7.00.

A second approach for the business person is to mark up all merchandise a given percent (like 40%) over cost. Owners who use this method have usually been in business for several years. They have quite thoroughly investigated the industry they are involved in. Such business people have found that 60% or 45% or 40% is the average mark-up necessary to cover the expenses of staying in business, plus the profit needed to make a living.

How do you calculate the mark-up for an item? For Method 1 follow these steps.

Method 1 - using three steps

1. Convert the percent to its decimal equivalent.
2. To calculate mark-up, multiply the decimal by the invoice price.
3. Selling price = invoice price + mark-up

Example 1

Incoming merchandise is listed on the invoice at a cost of $3.65 per item. The merchant marks up the item 40% over the cost. What will the selling price be?

1. 40% = .40
2. mark-up .40 x $3.65 = $1.46
3. selling price $3.65 + $1.46 = $5.11

$5.11 is an odd amount, one that is not usually listed on a price tag. The business owner will probably decide to round either up or down to a final selling price of $5.15 or $5.10.

Example 2

The wholesale cost of an item is $5.20. If the mark-up rate is 35%, what is the selling price of the item?

1. 35% = .35
2. mark-up .35 x $5.20 = $1.82
3. selling price $1.82 + $5.20 = $7.02

Here, too, $7.02 is an odd amount, so the selling price will probably be rounded to $7.00 or $7.10.

Method 2 - using two steps

This alternate method eliminates step 2 from the examples just discussed. Try this method for finding the mark-up of an item.

1. *Think:* New rate = 100% + percent of mark-up
2. Selling price = new rate in decimal form x wholesale price

Try using this method on Example 1. The computations would be:

1. new rate 100% + 40% = 140% = 1.40
2. selling price 1.40 x $3.65 = $5.11

For Example 2:

1. new rate 100% + 35% = 135% = 1.35
2. selling price 1.35 x $5.20 = $7.02

Ratio Method

Some business owners mark their merchandise up using a ratio like 2:1. When this method is applied to the wholesale price of an item of merchandise, that price will be multiplied by 2 to find the selling price. A 3:1 mark-up means the wholesale price of the merchandise will be multiplied by 3 to obtain the selling price.

Example 3

An item of merchandise costs a business owner $4.22. The owner uses a 3:1 mark-up ratio to calculate the selling price of the item.

$4.22 x 3 = $12.66, the selling price

But this is an odd amount, so the owner will probably round the price either up or down to $12.70 or $12.65.

Handling Money

In the variety of jobs available in the horticulture/landscape industry, you often have to handle money at one time or another. Everyone you deal with– customers, employers, wholesalers, and others– takes a very serious view of how you as an employee handle money. Many a person who has been a good employee in most ways has lost the job because of an inability to handle money carefully and accurately. After all, money is the backbone of any business. Only with wise and careful handling of money can a business be successful.

Making Change

One of the first positions you may have to handle money in is that of sales clerk. The sales clerk receives money from customers and must give them change. The easiest way to make change is to start with the amount of the purchase and "add up" to the next highest bill.

For example, the total amount of a customer's purchase is $9.69. The customer gives you a $20 bill to pay for it. You can "add up" to make the change. (Option 1) 1 penny makes $9.70, a nickel makes $9.75, and a quarter adds up to $10.00. Add a ten-dollar bill and you have made change for the twenty-dollar bill. (Option 2) You could "add up" by giving 1 penny to make $9.70, 3 dimes to make $10, and 2 five-dollar bills to make change for the twenty dollars that was tendered. The exact change you return to the customer will depend on how much change in each denomination is in the cash drawer. Whatever combination you use, be sure to give the **correct** change.

When making change for a bill, take the precaution to put the bill the customer gives you on the ledge of the cash register. Do not put it in the drawer until you have made the proper change. Then there should be no confusion as to what denomination of bill the customer gave you. It is quite common for a customer to claim that the sales clerk was given a bill of a higher denomination. Avoid such misunderstanding by keeping the bill in full view of both of you.

Completing Cash Register Tally Sheets

Cash register tally sheets are valuable to the sales clerk and the entire business. A tally sheet filled out properly will help you keep track of the money and checks taken in and the money paid out for services or merchandise on a daily basis.

Examples of cash register tally sheets are shown in Figures 3-10 and 3-11. Both do the job; they simply add up the money in different ways.

Begin each day at the cash register with a set amount of change. Use the same amount every day. Then, even if someone forgets to write it down, the amount of money at the start of the day is always known.

Look over the two-part tally sheet shown in Figure 3-10. Note that the coins and bills are itemized, while the checks are lumped together as one sum. The amount of money in the drawer at the start of the business day must be known and recorded (in this case, $75.00). The business took in $438.59 in sales and paid out $35 for a C.O.D. package. The sheet checks exactly. If a mistake was made during the day, either the blank marked "Shortage" or the one marked "Overage" should be checked and the amount recorded in the blank to the right.

AMOUNT OF MONEY IN REGISTER
at time of checking out

Kind of Money	Number	Value
Pennies	19	.19
Nickels	25	1.25
Dimes	24	2.40
Quarters	15	3.75
$ 1	9	9.00
$ 5	6	30.00
$ 10	2	20.00
$ 20	1	20.00
Checks	(7)	392.00
Money in Register		478.59

Figure 3-10

INFORMATION FROM THE REGISTER TAPE

Money at start	$ 75.00
+ Money received	438.59
TOTAL	513.59
- Money paid out	35.00
Money that should be in register	478.59

☐ **Shortage** $ ____________

☐ **Overage** $ ____________

☑ **Checks exactly**

Next, examine the tally sheet shown in Figure 3-11. With more details included, this sheet may provide a better record for someone handling the money in the business. Be sure to complete all the blanks at the top of the slip. This information could prove helpful at a later date.

Figure 3-11

Date 9/6/94 Shift No. 1

Cashier No. 32 Register No. 6

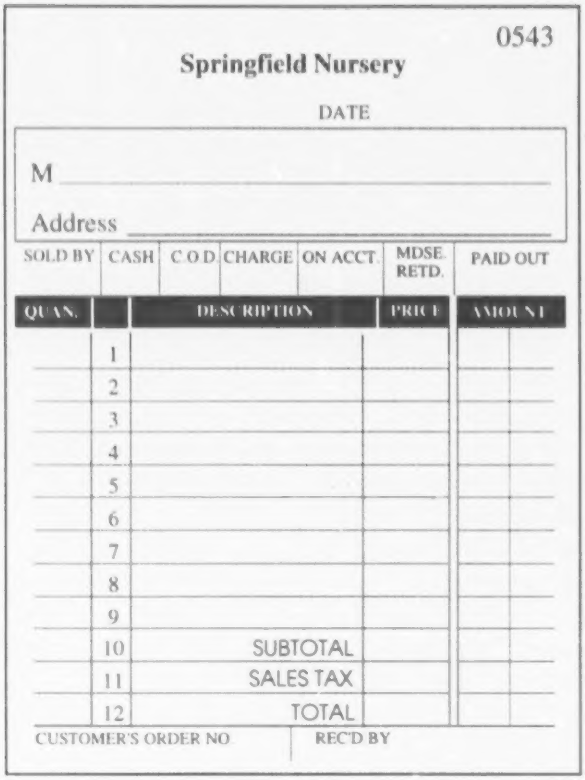
Ending Register Reading			798	08
Beginning Register Reading			400	80
Amount Registered			397	28
Amount in register AFTER change fund deducted:				
Coins	2	36		
Currency	183	00		
Checks	206	17		
Coupons	4	30		
Paid Outs	1	25		
Over Rings		20		
TOTAL			397	28
Amount Over ☐ or Short ☐ *(Check one)*			—	—

- The **ending register reading** should be taken from the tape at the end of the day.
- The **beginning register reading** comes from the tape at the end of the day before and should be recorded. (Tapes are sometimes locked into the register and are not removed daily.)
- Subtract one reading from the other and you have the **amount registered**. This is the amount of money that was handled during the day.
- On this slip you can record all the following: coins, currency, checks, and coupons.
- Also, if you paid for any services or merchandise (**paid outs**), record it.
- **Over rings** (mistakes) are also noted on this slip.
- (Note that the "change fund" is not taken into account and is taken out before the money is counted for the day.)

- The **total** of all these items - **coins** through **over rings** - is entered at the bottom right and compared with the **amount registered** at the top right of the slip. If the total is higher, you should check **amount over**; if lower, check **short** and enter the amount in the space to the right. If the amount is ***correct*** according to the amount registered, draw a line through the space to the right of **amount over** or **short** (as shown).

These are just a few examples of many different systems for keeping track of cash register money. Any system that works for your business can be used. Accuracy and consistency are the basic qualities you will need to keep your cash register account in good order.

Blank sales slips to use for practice



0543

Springfield Nursery

DATE

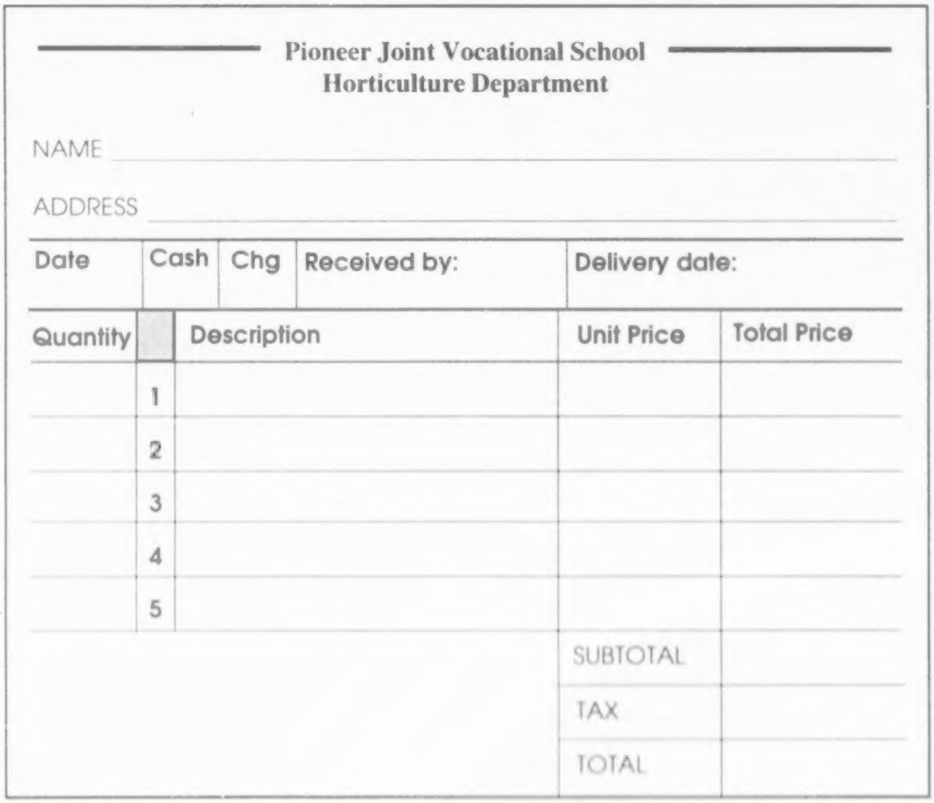
M ______

Address ______

SOLD BY	CASH	C.O.D.	CHARGE	ON ACCT.	MDSE. RETD.	PAID OUT

QUAN.		DESCRIPTION	PRICE	AMOUNT
	1			
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10	SUBTOTAL		
	11	SALES TAX		
	12	TOTAL		

CUSTOMER'S ORDER NO	REC'D BY



Pioneer Joint Vocational School
Horticulture Department

NAME ______

ADDRESS ______

Date	Cash	Chg	Received by:	Delivery date:

Quantity		Description	Unit Price	Total Price
	1			
	2			
	3			
	4			
	5			
			SUBTOTAL	
			TAX	
			TOTAL	

Chapter 3, Practice Set 1

Complete each of these sales slips, filling in the space to the left of each bold letter.

Pioneer Joint Vocational School
Horticulture Department

NAME Mike Jones

ADDRESS 523 Third Street, Ansonia, OH 45303

Date	Cash	Chg	Received by:	Delivery date:
9-20		✓	DH	

Quantity		Description	Unit Price	Total Price	
2	**1**	Trumpet Vine	13.00		**a**
1	**2**	Carolina Allspice	12.50		**b**
6	**3**	Sweet Autumn Clematis	3/26.95		**c**
3	**4**	Junipers	15.00		**d**
	5				
			SUBTOTAL		**e**
			TAX (5 3/4%)		**f**
			TOTAL		**g**

Green Valley Nursery

9/17/94

M D White

Address

Reg. No. _____ Clerk A

		ACCOUNT FORWARDED			
1	*African Violet*	10.00			**a**
2	*Cactus - 3*				
3	*2 - 7.50 ea*				**b**
4	*1 - 5.00 ea*				**c**
5	*Decorative Pots*				
6	*1 - ea 9.00*				**d**
7	*1 - ea 5.25*				**e**
8	*2 - ea 8.50*				**f**
9					
10					
11					
12	SUBTOTAL				**g**
13	(5%) SALES TAX				**h**
14	TOTAL				**i**

Chapter 3, Practice Set 2

Complete each of these sales slips, filling in the space to the left of each bold letter.

Pioneer Joint Vocational School
Horticulture Department

NAME J. Haynes

ADDRESS 4120 Grandview Rd, Risingsun, OH 43457

Date	Cash	Chg	Received by:	Delivery date:
9-17	✓		MB	

Quantity		Description	Unit Price	Total Price	
4 doz	**1**	Hyacinth bulbs	5.25/doz		**a**
	2	Iris bulbs			
2 doz	**3**	blue	3.75/doz		**b**
2 doz	**4**	yellow	5.25/doz		**c**
2 doz	**5**	white	3.75/doz		**d**
	6				
1	**7**	Hand tool set	12.95		**e**
1	**8**	Hoe	6.50		**f**
	9				
			SUBTOTAL		**g**
			TAX (6%)		**h**
			TOTAL		**i**

4705

Green Valley Nursery

DATE 9/16/94

M H. Sakamoto

Address 343 Broad St., Cols.

SOLD BY	CASH	C O D	CHARGE	ON ACCT	MDSE RETD	PAID OUT
JR			✓			

QUAN.		DESCRIPTION	PRICE	AMOUNT	
	1	Tulips			
6	2	Apricot Beauty	6/3.25		**a**
12	3	King's Ransom	doz/5.25		**b**
6	4	Garden Party	6/3.00		**c**
	5	Daffodils			
24	6	Golden Ducat	doz/9.25		**d**
12	7	Snowball	doz/9.25		**e**
	8				
	9				
	10	SUBTOTAL			**f**
	11	(5%) SALES TAX			**g**
	12	TOTAL			**h**

CUSTOMER'S ORDER NO REC'D BY

Chapter 3, Practice Set 3

Check these two invoices. If there are errors, correct them and write the new total in the blank to the left of each bold letter.

INVOICE

Wayside Gardens
Hodges, SC 29695

INVOICE NO
8404

SOLD TO: Green Valley Nursery
STREET ADDRESS: Green Valley Road
CITY: Upstate STATE: NY ZIP: 20204

SHIPPED TO: same
STREET ADDRESS:
CITY: STATE: ZIP:

CUSTOMER'S ORDER: 3
SALE BY: AW
TERMS: 30 days
F.O.B.:
DATE: 9/26/94

2	Snowball Plantlite - 0551	ea	25	75	51	50	______ **a**
6	Replacement tubes for above - 0553	ea	5	75	28	75	______ **b**
6	Book - 0755	ea	13	98	83	88	______ **c**
5	Bird feeder - 0953	ea	9	95	49	75	______ **d**
	TOTAL				213	88	______ **e**

This invoice is _____ correct _____ incorrect *(Check one)*

INVOICE

Wayside Gardens
Hodges, SC 29695

INVOICE NO
8405

SOLD TO: Green Valley Nursery
STREET ADDRESS: Green Valley Road
CITY: Upstate STATE: NY ZIP: 20204

SHIPPED TO: same
STREET ADDRESS:
CITY: STATE: ZIP:

CUSTOMER'S ORDER: 1
SALE BY: AW
TERMS: Cash
F.O.B.:
DATE: 3/16/95

	Phlox						
6 doz	Charles Van Delft	ea	2	65	190	80	______ **a**
6 doz	Russian Violet	ea	2	65	190	80	______ **b**
5 doz	Progress	ea	2	65	13	25	______ **c**
7 doz	White Admiral	ea	2	65	222	60	______ **d**
10 doz	Pinafore Pink	doz	32	00	320	00	______ **e**
6 doz	Norah Leigh	doz	35	00	210	00	______ **f**
	TOTAL				1147	45	______ **g**

This invoice is _____ correct _____ incorrect *(Check one)*

Chapter 3, Practice Set 4

Using blank sales slips, write up each of the following orders.

<table>
<tr><th></th><th>Personal Information</th><th>Order</th></tr>
<tr><td>1</td><td>John Brown
12 Fifth Street
Galion, Ohio 44833</td><td>7 red roses @ $25 per dozen
5 white football mums @ $30 per dozen</td></tr>
<tr><td></td><td colspan="2">Other Info. Cash sale; delivery date today; sales tax rate 5%</td></tr>
<tr><td>2</td><td>Alice Simpson
43 Water Street
Ontario, Ohio 44862</td><td>3 red carnations @ $.75
4 white carnations @ $.75
1 hanging basket of impatiens @ $9.95</td></tr>
<tr><td></td><td colspan="2">Other Info. Cash sale; delivery October 2; sales tax rate 6%</td></tr>
<tr><td>3</td><td>George Burns
123 Leslie Lane
Shelby, Ohio 44875</td><td>3 pink roses @ $40 per dozen
5 white daisies @ $6.00 per dozen
1 gift box @ $1.50</td></tr>
<tr><td></td><td colspan="2">Other Info. Cash sale; delivery date today; sales tax rate 6%</td></tr>
<tr><td>4</td><td>Mildred Jones
21 Applegate Road
Bucyrus, Ohio 44820</td><td>2 mum plants @ $2.98
6 bulbs @ 3 for $5.98
3 bulbs @ $4.98 per dozen</td></tr>
<tr><td></td><td colspan="2">Other Info. Charge sale; delivery date today; sales tax rate 5 ½%</td></tr>
<tr><td>5</td><td>Judy Phillips
24 Second Street
Charleston, SC 29407</td><td>2 bags of mulch @ 3 for $10.00
16 feet of edging @ $5.98 per yard
3 bags of fertilizer @ $7.98</td></tr>
<tr><td></td><td colspan="2">Other Info. Cash sale; delivery date October 14; sales tax rate 6 ¼%</td></tr>
<tr><td>6</td><td>Julie Smith
6378 Roberts Drive
Canton, Ohio 44720</td><td>3 mum plants @ $5.98
5 yards of ribbon @ $.79 per foot
2 lawn decorations @ $7.50</td></tr>
<tr><td></td><td colspan="2">Other Info. Cash sale; delivery date tomorrow; sales tax rate 6%</td></tr>
<tr><td>7</td><td>Bob Monroe
178 Smith Road
Harrisburg, PA 15901</td><td>½ dozen red roses @ $35 per dozen
½ dozen white carnations @ $17.50 per dozen
1 gift box @ $1.50</td></tr>
<tr><td></td><td colspan="2">Other Info. Cash sale; delivery date today; sales tax rate 6%</td></tr>
<tr><td>8</td><td>Merna Snipes
243 Bowman Road
Garland, TX 75040</td><td>5 white carnation bouquets with red ribbon @ $5.98
5 white carnation corsages @ $2.98
1 red rose presentation bouquet @ $25.00</td></tr>
<tr><td></td><td colspan="2">Other Info. Cash sale; pick up Thursday noon; sales tax rate 6 ½%</td></tr>
</table>

See page 90 for blank sales slips

Chapter 3, Practice Set 5

Complete the following four deposit slips.

1 Deposit slip for Lynn Cooke
check for $32.00
currency totaling $62.00

Name ____________________

		DOLLARS	CENTS
CASH	CURRENCY		
	COINS		
CHECKS	LIST SEPARATELY		
SUBTOTAL			
⇨ LESS CASH RECEIVED			
TOTAL DEPOSIT			

2 Deposit slip for Marc Barnes
check for $149.55 coins totaling $1.48
check for $72.75 receives $50 in cash

Name ____________________

		DOLLARS	CENTS
CASH	CURRENCY		
	COINS		
CHECKS	LIST SEPARATELY		
SUBTOTAL			
⇨ LESS CASH RECEIVED			
TOTAL DEPOSIT			

3 Deposit slip for Sarah Jones
check for $215.60
coins totaling $1.01
receives $38 in cash

Name ____________________

		DOLLARS	CENTS
CASH	CURRENCY		
	COINS		
CHECKS	LIST SEPARATELY		
SUBTOTAL			
⇨ LESS CASH RECEIVED			
TOTAL DEPOSIT			

4 Deposit slip for Juan Garcia
currency totaling $430
coins totaling $5.89
check for $96.75
check for $27.22

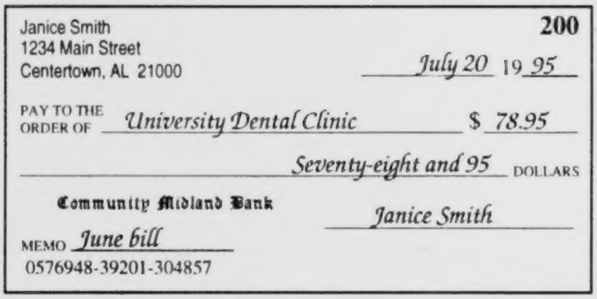
Name ____________________

		DOLLARS	CENTS
CASH	CURRENCY		
	COINS		
CHECKS	LIST SEPARATELY		
SUBTOTAL			
⇨ LESS CASH RECEIVED			
TOTAL DEPOSIT			

5 Jan Smith wrote the check at the right: number 200 to University Dental Clinic for $78.95. Did she write the amount in words correctly? If not, write the correct wording here.

____

____



Janice Smith
1234 Main Street
Centertown, AL 21000

200

July 20 19 *95*

PAY TO THE ORDER OF *University Dental Clinic* $ *78.95*

Seventy-eight and 95 DOLLARS

Community Midland Bank

Janice Smith

MEMO *June bill*

0576948-39201-304857

6 For what purpose did Jan write the check?

____

(continued)

7 Pat Moore is paying for an auto repair bill of $137.52. Did Pat write the amount of the check correctly, both as a numeral and in words? If not, write the correct amount.

____

____

Patrick James Moore
2100 Seventh Avenue
Newark, PA 17507

507

May 4 19 *95*

PAY TO THE ORDER OF *Brown's Auto Shop* $ *137.52*

One hundred twenty-seven and 52/100 DOLLARS

Community Midland Bank

Patrick J. Moore

MEMO ______________

0576948-39201-304857

8 What is the number of the check that Pat used to pay for the auto repair?

____

9 Nikki Burns wrote a check to the First Bank of Boor for $919.00. For what purpose did she write the check?

____

10 Nikki's check is incomplete as it is. What must she add before sending it to the bank?

____

Nikki Burns
34 River Glen
Boulder, CO 73001

3081

April 22 19 *95*

PAY TO THE ORDER OF *First Bank of Boor* $ *919.00*

Nine hundred nineteen and 00/100 DOLLARS

Community Midland Bank

____

MEMO *House payment*

8405761-10293-758403

11 Aaron Lopez intended to write check number 65 to Arizona Electric Company to pay his July bill which totaled $43.11. Is the check written correctly? If not, what corrections are needed?

____

____

____

Aaron Lopez
430 Broad Street
Newtown, AZ 94000

65

August 15 19 *96*

PAY TO THE ORDER OF *Downtown Power* $ *43.11*

Forty-three and 01/100 DOLLARS

Community Midland Bank

Aaron Lopez

MEMO *June bill*

0576948-39201-304857

12 Chris Richards opened a new checking account on January 2 by depositing a paycheck for $309.71. In the check register below, record this deposit. Then calculate the balance after each transaction. What is the new balance (**d**)? Fill in the blanks below.

CHECK NO.	DATE	CHECK ISSUED TO	AMOUNT OF CHECK		✓	Date of Dep.	AMOUNT OF DEPOSIT		BALANCE		
					OPENING BALANCE →				—	—	
						1/2					________ b
101	1/2	*Clinton Clothes*	171	08			a ↗				________ c
102	1/7	*Discount City*	15	89							________ d

(continued)

13 Debbie's checkbook balance was $130.25 on August 7. The check register shows the transactions completed since then. Fill in the blanks opposite bold letters and find the new balance.

CHECK NO.	DATE	CHECK ISSUED TO	AMOUNT OF CHECK	✓	Date of Dep.	AMOUNT OF DEPOSIT	BALANCE	
						BALANCE BROUGHT FORWARD →	*130 25*	
409	*8/10*	*Phil's Sport Shop*	*81 23*					**a**
	8/12	*deposit*			*8/12*	*527 82*		**b**
410	*8/13*	*City Water Dept.*	*42 08*					**c**
411	*8/14*	*Telephone Co.*	*38 15*					**d**

14 Bill's latest transactions are shown in the check register. Check the computations on each line. If there are any errors, write the correct figures to the right beside the bold letters.

CHECK NO.	DATE	CHECK ISSUED TO	AMOUNT OF CHECK	✓	Date of Dep.	AMOUNT OF DEPOSIT	BALANCE	
						BALANCE BROUGHT FORWARD →	*482 71*	
3801	*7/20*	*IGA*	*101 13*				*381 58*	______ **a**
3802	*7/21*	*Dr. J. Burns*	*30 00*				*351 58*	______ **b**
3803	*7/23*	*Cash*	*100 00*				*251 58*	______ **c**
	7/25	*deposit*			*7/25*	*352 10*	*703 68*	______ **d**
3804	*7/26*	*J.B. Paint Store*				*86 32*	*790 00*	______ **e**

Chapter 3, Practice Set 6

Use the checkbook register, bank statement, and reconciling form to balance this checking account.

CHECK NO.	DATE	CHECK ISSUED TO	AMOUNT OF CHECK		✓	Date of Dep.	AMOUNT OF DEPOSIT		BALANCE	
		BALANCE BROUGHT FORWARD →							596	52
044	10/20	Kroger's	52	17	✓				544	35
045	10/21	Sears	38	92	✓				505	43
046	10/27	Tire Mart	102	70	✓				402	73
047	11/3	K Mart	73	42					329	31
	11/4	deposit				11/4	250	00	579	31
048	11/9	Central Telephone	19	71					559	60
049	11/15	Cash	60	00					499	60
	11/20	deposit				11/20	250	00	749	60
050	11/20	United Power Co.	23	19					726	41

land Bank

STATEMENT FOR THE ACCOUNT OF

Shelley Summers
Joint Vocational School
Shelby, OH 44875

closing date
12/20/96

CHECKS AND OTHER CHARGES			DEPOSITS AND CREDITS		BALANCE
date	check number	amount	date	amount	
11/5	047	$73.42	11/4	$250.00	$652.73
11/15	048	19.71			579.31

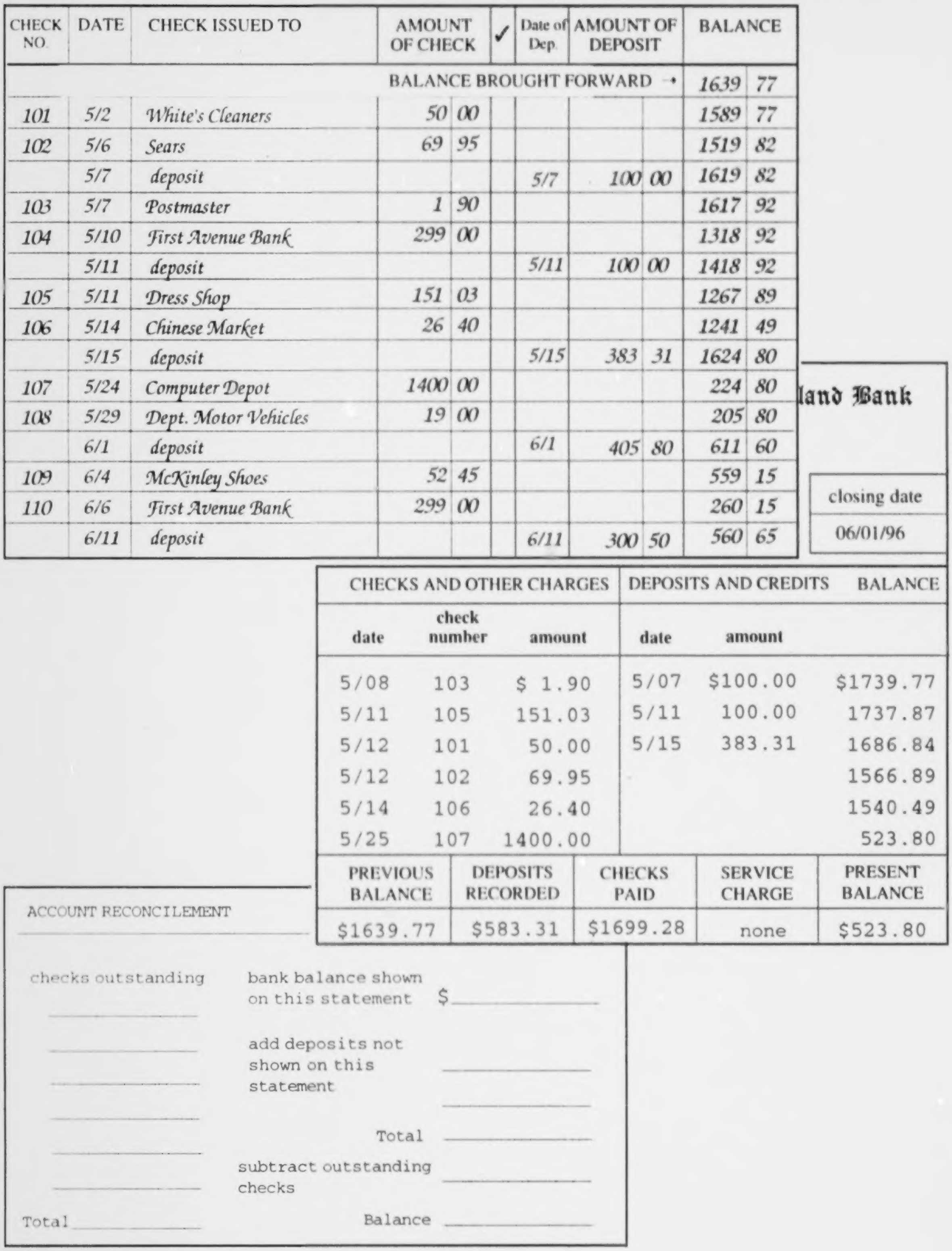
PREVIOUS BALANCE	DEPOSITS RECORDED	CHECKS PAID	SERVICE CHARGE	PRESENT BALANCE
$402.73	$250.00	$93.13	$2.90	$556.70

ACCOUNT RECONCILEMENT

checks outstanding		
________	bank balance shown on this statement	$________
________	add deposits not shown on this statement	________
________		________
________	Total	________
________	subtract outstanding checks	________
________		
Total ________	Balance	________

Chapter 3, Practice Set 7

Use the checkbook register, bank statement, and reconciling form to balance this checking account.



CHECK NO.	DATE	CHECK ISSUED TO	AMOUNT OF CHECK	✓	Date of Dep.	AMOUNT OF DEPOSIT	BALANCE
						BALANCE BROUGHT FORWARD →	1639 77
101	5/2	White's Cleaners	50 00				1589 77
102	5/6	Sears	69 95				1519 82
	5/7	deposit			5/7	100 00	1619 82
103	5/7	Postmaster	1 90				1617 92
104	5/10	First Avenue Bank	299 00				1318 92
	5/11	deposit			5/11	100 00	1418 92
105	5/11	Dress Shop	151 03				1267 89
106	5/14	Chinese Market	26 40				1241 49
	5/15	deposit			5/15	383 31	1624 80
107	5/24	Computer Depot	1400 00				224 80
108	5/29	Dept. Motor Vehicles	19 00				205 80
	6/1	deposit			6/1	405 80	611 60
109	6/4	McKinley Shoes	52 45				559 15
110	6/6	First Avenue Bank	299 00				260 15
	6/11	deposit			6/11	300 50	560 65

land Bank

closing date

06/01/96

CHECKS AND OTHER CHARGES			DEPOSITS AND CREDITS		BALANCE
date	check number	amount	date	amount	
5/08	103	$ 1.90	5/07	$100.00	$1739.77
5/11	105	151.03	5/11	100.00	1737.87
5/12	101	50.00	5/15	383.31	1686.84
5/12	102	69.95			1566.89
5/14	106	26.40			1540.49
5/25	107	1400.00			523.80

PREVIOUS BALANCE	DEPOSITS RECORDED	CHECKS PAID	SERVICE CHARGE	PRESENT BALANCE
$1639.77	$583.31	$1699.28	none	$523.80

ACCOUNT RECONCILEMENT

checks outstanding

____

____

____

____

____

____

Total ______________

bank balance shown on this statement $______________

add deposits not shown on this statement ______________

____

Total ______________

subtract outstanding checks ______________

Balance ______________

Chapter 3, Practice Set 8

In this example of monthly checking activity:

- Start with a beginning balance of $60.01.
- Write each entry in the check register on the next page.
- Using the bank statement and check register, complete the account reconcilement form below.

1. On July 6, write check number 304 to pay John Cole $12.15 for newspaper delivery for the month.
2. On July 7, write check number 305 to pay the monthly insurance premium of $20.00 to Frank Life Insurance Co.
3. On July 8, deposit the total amount of a paycheck for $1033.04.
4. On July 9, write check number 306 to Central Gas Co. to pay the June bill of $25.43.
5. On July 10, write check number 307 to pay the O'Hara Company $99.52 for a microwave purchased.
6. On July 12, write check number 308 to make a house payment of $882.11 to First Bank of Boor.
7. On July 13, write check number 309 to Klingbiel's for sister's birthday gift costing $23.79.
8. On July 17, deposit a dividend check for $32.75.
9. On July 17, write check number 310 to pay Cather's Bug Service $37.00 to exterminate ants on the back porch.
10. On July 18, write check number 311 for $22.97 to renew subscription to *Horse Magazine*.
11. On July 20, deposit $1000 in cash.
12. On July 25, write check number 312 for $100 to buy shares of Wendall stock.

ACCOUNT RECONCILEMENT

checks outstanding
____
____
____
____
____
____
Total __________

bank balance shown on this statement $__________
add deposits not shown on this statement __________
____
Total __________
subtract outstanding checks __________
Balance __________

CHECK REGISTER

CHECK NO	DATE	CHECK ISSUED TO	AMOUNT OF CHECK	✓	Date of Dep.	AMOUNT OF DEPOSIT	BALANCE
					BALANCE BROUGHT FORWARD →		60 01

BANK STATEMENT

First Bank of Boor
431 Second Street
Shelby, OH 44875

Terry Deal
Pioneer Joint Vocational School
Shelby, OH 44875

closing date
07/26/92

CHECKS AND OTHER CHARGES			DEPOSITS AND CREDITS		BALANCE
date	check number	amount	date	amount	
7/07	304	$ 12.15			$47.86
7/08	305	20.00	7/08	$1033.04	1060.96
7/10	307	99.52			961.38
7/14	309	23.79			937.59
7/17	310	37.00	7/17	32.75	933.34

PREVIOUS BALANCE	DEPOSITS RECORDED	CHECKS PAID	SERVICE CHARGE	PRESENT BALANCE
$60.01	$1065.79	$192.46	$.90	$932.44

Chapter 3, Practice Set 9

Answer each of these questions.

1. A garden center manager decided to have a sale on all the bedding plants. The bedding plant six-packs that had been selling for $1.09 each were marked down 20%.

   a. What would be the new sale price for a six-pack? ____________

   b. If the sales tax rate is 5%, how much sales tax would a customer have to pay on the sale price? ____________

   c. What total amount would the customer have to pay for the six-pack on sale? ____________

2. A certain variety of bulb for fall planting was priced at four for $3.50. Now, late in the fall, the price is reduced 25%. What is the reduced price for four bulbs? ____________

3. A nursery operator ordered some nursery stock from a wholesale company. If the invoice (bill) is paid within ten days of receipt, the operator will receive a 15% discount.

   a. On a bill of $865.00, what would the discount be? ____________

   b. What amount would be written on the check if there is no sales tax? ____________

4. An invoice listed three available discount figures: one for early ordering (5%), one for early payment (10%), and one for volume of the order (10%). The nursery operator was entitled to all three. What would the operator pay on an invoice of $1,125.00? ____________

5. Mr. and Mrs. Lee went to their local garden center to purchase a few items and found a sale in progress. The Lees purchased the following items at the following sale prices. Find their **total** bill including 5% sales tax.

Quantity	Description	Original Price	Discount	Sale Price
1	garden rake	$8.25	30%	____________
4	sections - fencing	$2.50	25%	____________
1	can of insecticide	$3.59	20%	____________
1	set of garden tools	$12.98	40%	____________
			SUBTOTAL	____________
			SALES TAX	____________
			TOTAL	____________

(continued)

Chapter 3, Practice Set 9 *(page two)*

6. Find the total cost of the following purchases including 6% sales tax.

Quantity	Description	Original Price	Discount	Sale Price
1	Pink Pepper Bush	$15.98	20%	
3	Bloodgood Dogwood	$19.95	15%	
7	Bedding plants	$1.79	25%	
2	decorator pots	$7.50	15%	
3	decorator pots	$6.75	30%	
1	decorator pot	$11.95	25%	
			SUBTOTAL	
			SALES TAX	
			TOTAL	

7. A customer is interested in ordering the following items. Find the total cost of the order including 5% sales tax.

Quantity	Description	Original Price	Discount	Sale Price
6	Daphne Spiraea	6 for $19.99	18%	
12	Aurelian Trumpet	3 for $20.99	12%	
48	Tulip mix	12 bulbs/$8.95	15%	
5	Indoor Gloxinia kits	$12.50	10%	
			SUBTOTAL	
			SALES TAX	
			TOTAL	

Find the answer for each question, doing the calculations on a separate sheet of paper.

1. Brian ordered the following merchandise from Lakewood Wholesale Distributors:

   5 cartons of corsage boxes @$16.00 per carton
   2 boxes of corsage bags @$1.95 per box
   5 gross of plant sleeves @$12.95 per gross

   The invoice offered the following discounts:

   3% if bill is paid by December 10
   2% if purchase total is more than $60

   Brian was ready to pay the bill on December 1. What was the total amount he owed after taking all applicable discounts? (Do not include sales tax.)

   ____

2. Aimee, manager of Gilbert's Landscaping Service, bought the following nursery stock on June 5:

   3 Taxus yews @$12.95
   6 Bird's Nest spruces @$8.95
   3 flats of myrtle @$24.00
   12 Blue Rug junipers @$4.50

   Gilbert's offered the following discounts:

   10% for a cash-and-carry purchase
   5% if the purchase totaled at least $300

   Aimee decided to take the stock in her van. She wrote a check immediately to pay for the purchase. Find the total amount she owed. (Do not include sales tax.)

   ____

3. Hank, owner of Ontario Greenhouses, in preparation for bedding plant production, placed the following order:

   10 cases of cell-packs @$28.00 per case
   8 cases of trays @$43.25 per case
   6 cases of hanging baskets @$34.39 per case
   10 bags of Super-gro Mix @$21.95 per bag

   The invoice offered the following discounts:

   8% if invoice totaled at least $1000
   5% if at least 8 cases of containers are purchased (including pots, baskets, trays, and cell-packs)
   2% if paid for within 10 days of receiving invoice

   Hank received the invoice on July 12 and was prepared to pay it on July 20. Find the total amount he owed after taking all applicable discounts. (Do not include sales tax.)

   ____

Chapter 3, Practice Set 11

Price List

Tulips - $4.98 per doz
Baskets - as marked
Daffodils - $6.75 per doz
Crocus - $3.29 per doz
Fertilizer - $9.98 per bag
Hardy mum plants - $3.50 ea
Garden tools - $12.98 per set
Plastic edging - $9.98 per yd
Plastic ribbon - $5.50 per yd
Shading cloth - $13.50 per yd

Harvest Sale

Bulbs - 20% off
Baskets - 15% off
Fertilizer - 25% off
Hardy mum plants - 40% off
Garden tools - 50% off

Use the price list and sale information to write each of the following orders.

	Personal Information	Order
1	Paul Ebersole 543 Third Street Wooster, OH 44691	2 dozen tulip bulbs 4 dozen daffodil bulbs 2 baskets @ $6.79
	Other Info. Charge purchase; today's date; deliver Oct. 13; 6% sales tax	
2	Marie Smith 3456 Auburn Lane Toledo, OH 43600	3 hardy mum plants 1 set of garden tools 3 dozen crocus bulbs
	Other Info. Cash purchase; today's date; cash and carry; 6% sales tax	
3	Bob Reith 908 Sommers Road Easton, MA 02375	3 bags of fertilizer 2 sets of garden tools 5 dozen daffodil bulbs 4 dozen crocus bulbs
	Other Info. Cash purchase; today's date; deliver Oct. 15; 5% sales tax	
4	Marcia Murray 546 Andover Road Mansfield, OH 44904	3 baskets @ $5.98 2 dozen tulip bulbs 4 dozen daffodil bulbs 5 hardy mum plants
	Other Info. Charge purchase; today's date; deliver Oct. 16; 5% sales tax	
5	Dale Chang 2417 Park Drive Tampa, FL 33610	25 ft of edging 4 yd of plastic ribbon 7 ft of shading cloth
	Other Info. Cash purchase; today's date; cash and carry; 6% sales tax	

See page 90 for blank sales slips

Find the answer for each question.

1. A vase for the Christmas season costs the Kay Imports manager $7.50. If she uses a 35% mark-up over cost, what will be the selling price for the vase?

____

2. Hilltop Garden Center sells Greenyard lawn mowers. The wholesale price of one mower is $225. The owner uses a 45% mark-up over cost to cover freight, overhead, and profit. What price will be on the sales tag?

____

3. A shipment of merchandise has arrived at Hilltop Garden Center. All the items must be priced before they are put on the shelves. Use the mark-up rates given below to find the exact selling price for each item on the list. Then round that price up and down and fill in the blanks.

Item	Cost	Mark-up Rate	Exact Price	Rounded Up	Rounded Down
garden gloves	$2.45	40%	____________	____________	____________
trellis	$6.75	35%	____________	____________	____________
insecticide	$1.67	20%	____________	____________	____________
bark mulch (bag)	$1.17	65%	____________	____________	____________

4. A garden center marks up all its juniper shrubs 100%. If the base cost per plant is $8.25, what will be the selling price of each shrub?

____

5. The manager of AZ Florist paid the wholesale price of $4.89 for a 6-inch azalea plant. If the owner uses a 45% mark-up rate, what will the plant sell for?

____

6. The owner of Country Greenhouses pays $36 for a carton of 24 hanging baskets. Find the selling price of one basket if a 2:1 mark-up rate is used.

____

7. The wholesale price of a dozen roses is $16.00. Find the selling price of one rose if a 75% mark-up over cost is used.

____

8. The wholesale price of a decorative pot is $5.67. If the manager of Hilltop Garden Center uses a 3:1 mark-up for these pots, what will the selling price be?

____

9. A bunch of 25 carnations costs Joe's Flowers' owner $8.25. If Joe uses a mark-up rate of 85%, find the selling price of a single carnation.

____

Starting with the amount of sale, count out the change due each of the ten customers for problems A through J.

	Cost of Items Purchased by Customers									
	A		B		C		D		E	
	$9.00 .83 .17 2.50		$3.25 .20 .20 .20		$7.89 .89 12.00 6.50		$7.50 1.02 .75 .79		$16.50 12.00 .39 2.50	
Subtotal										
Sales tax (5%)										
Amt. of sale										
Money received	$20.00		$5.00		$30.00		$20.00		$50.00	
CHANGE	No.	Total Value	No.	Total Value	No.	Total Value	No.	Total Value	No.	Total Value
Pennies										
Nickels										
Dimes										
Quarters										
$1										
$5										
$10										
Total Change										

	F		G		H		I		J	
	$4.50 .59 2.25		$16.67 1.79 3.35 .19		$ 2.25 19.99 5.50		$ .15 .15 .32 .16		$ 6.50 17.00 3.00	
Subtotal										
Sales tax (5%)										
Amt. of sale										
Money received	$10.00		$50.00		$30.00		$10.00		$40.00	
CHANGE	No.	Total Value	No.	Total Value	No.	Total Value	No.	Total Value	No.	Total Value
Pennies										
Nickels										
Dimes										
Quarters										
$1										
$5										
$10										
Total Change										

Count out the change due each customer (1-23). Fill in the appropriate spaces.

	Amount of Sale	Amount Presented	Change Due	CENTS				DOLLARS		
				1	5	10	25	1	5	10
1	$ .59	$ 1.00								
2	2.95	5.00								
3	3.15	5.15								
4	12.57	20.00								
5	6.95	10.00								
6	3.25	5.00								
7	41.54	45.75								
8	2.09	5.00								
9	6.15	7.00								
10	3.70	10.75								
11	9.52	10.02								
12	29.76	35.00								
13	21.34	50.00								
14	49.27	60.00								
15	87.43	90.50								
16	10.45	20.00								
17	8.17	10.25								
18	13.90	15.00								
19	21.78	25.00								
20	12.09	20.10								
21	38.67	40.00								
22	56.49	60.00								
23	34.32	40.50								

Chapter 3, Practice Set 15

Complete each two-part tally sheet. Fill in blanks **a** through **k** for each and the shortage/overage sections.

1

AMOUNT OF MONEY IN REGISTER
at time of checking out

Kind of Money	Number	Value	
Pennies	85		a
Nickels	72		b
Dimes	43		c
Quarters	23		d
$ 1	24		e
$ 5	12		f
$ 10	5		g
$ 20	2		h
Money in Register			i

INFORMATION FROM THE REGISTER TAPE

Money at start $ 25.00
+ Money received 217.64
TOTAL ________ j
− Money paid out 54.14
Money that should be in register ________ k

☐ **Shortage** $ ________
☐ **Overage** $ ________
☐ **Checks exactly**

2

AMOUNT OF MONEY IN REGISTER
at time of checking out

Kind of Money	Number	Value	
Pennies	34		a
Nickels	104		b
Dimes	200		c
Quarters	40		d
$ 1	30		e
$ 5	7		f
$ 10	9		g
$ 20	5		h
Money in Register			i

INFORMATION FROM THE REGISTER TAPE

Money at start $ 50.00
+ Money received 327.48
TOTAL ________ j
− Money paid out 86.94
Money that should be in register ________ k

☐ **Shortage** $ ________
☐ **Overage** $ ________
☐ **Checks exactly**

3

AMOUNT OF MONEY IN REGISTER
at time of checking out

Kind of Money	Number	Value	
Pennies	34		a
Nickels	14		b
Dimes	15		c
Quarters	20		d
$ 1	15		e
$ 5	6		f
$ 10	5		g
$ 20	2		h
Money in Register			i

INFORMATION FROM THE REGISTER TAPE

Money at start $ 25.00
+ Money received 175.83
TOTAL ________ j
− Money paid out 57.29
Money that should be in register ________ k

☐ **Shortage** $ ________
☐ **Overage** $ ________
☐ **Checks exactly**

Chapter 3, Practice Set 16

Complete each tally sheet, filling in blanks **a** through **l**.

1

Date ______ Shift No. ______
Cashier No. ______ Register No. ______

Ending Register Reading			910	89	
Beginning Register Reading			462	90	
Amount Registered					a
Amount in register AFTER change fund deducted:					
Coins	17	73			
Currency	241	00			
Checks	179	07			
Coupons	6	15			
Paid Outs	2	97			
Over Rings	1	40			
TOTAL					b
Amount Over ☐ or Short ☐ *(Check one)*					c

2

Date ______ Shift No. ______
Cashier No. ______ Register No. ______

Ending Register Reading			4035	80	
Beginning Register Reading			2734	40	
Amount Registered					d
Amount in register AFTER change fund deducted:					
Coins	0	96			
Currency	593	00			
Checks	703	05			
Coupons	1	30			
Paid Outs	4	14			
Over Rings	0	00			
TOTAL					e
Amount Over ☐ or Short ☐ *(Check one)*					f

3

Date ______ Shift No. ______
Cashier No. ______ Register No. ______

Ending Register Reading			20102	75	
Beginning Register Reading			17948	39	
Amount Registered					g
Amount in register AFTER change fund deducted:					
Coins	3	72			
Currency	1207	00			
Checks	930	69			
Coupons	2	85			
Paid Outs	7	50			
Over Rings	2	60			
TOTAL					h
Amount Over ☐ or Short ☐ *(Check one)*					i

4

Date ______ Shift No. ______
Cashier No. ______ Register No. ______

Ending Register Reading			2160	46	
Beginning Register Reading			1021	37	
Amount Registered					j
Amount in register AFTER change fund deducted:					
Coins	4	62			
Currency	330	00			
Checks	779	05			
Coupons	5	17			
Paid Outs	19	75			
Over Rings					
TOTAL					k
Amount Over ☐ or Short ☐ *(Check one)*					l

CHAPTER 4

CONSTRUCTION

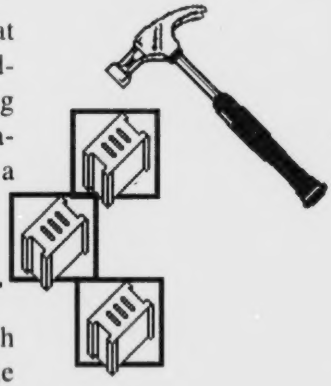
By the time you finish this chapter, you will be able to

1) find the number of landscape ties needed for a project.
2) find the number of bricks, patio blocks, or pavers needed for a project.
3) find the number of wall stones needed for a project.
4) find the amount of mulch, stone, or soil needed for a project.
5) determine the materials needed for building a deck.
6) determine the materials needed for building a fence.

* * * * * * * * * * * * * * *

Construction projects are becoming a major part of the horticulture industry. A landscape designer may consult a landscaping firm to learn what types of materials are readily available and what their current selling price is. An employee assigned a construction project must be able to determine amounts of materials needed for each project or design.

In this chapter you will learn certain mathematical procedures that will be useful in calculating amounts of materials needed for a landscaping or construction project. Even if you do not anticipate working on such construction projects, you will find this background information helpful. You will be better prepared to wait on a customer in a garden center or give a quick estimate to a client in design work.



Construction with Landscape Ties

Tie work in landscaping involves working with ties and with areas. Landscape ties are used for many construction projects like building retaining walls and edging gardens or driveways. These ties come in a range of sizes the most common of which are 6 feet and 8 feet. Before you can draw a plan for a project, you must know the measurements of the ties to be used. The examples used in this section have the following dimensions:

Six-foot (6') tie (Figure 4-1)

measurements: 6" x 6" x 6'

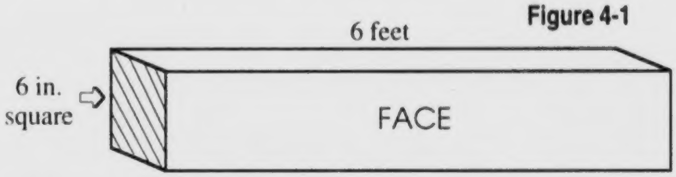


Figure 4-1

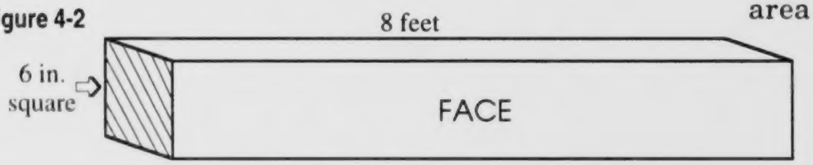
The "face" in each diagram is the part of the tie that is visible when you look at an installed wall.

area of face = 6 ft x 6 in.
= 6 ft x .5 ft
= 3 sq ft

The tie in Figure 4-1 covers 3 square feet of the face of a wall.

Eight-foot (8') tie (Figure 4-2)
measurements: 6" x 6" x 8'

Figure 4-2



area of face = 8 ft x 6 in.
= 8 ft x .5 ft
= 4 sq ft

This tie covers 4 square feet of the face of a wall.

Deadmen

Ties known as "deadmen" are also used in construction of a retaining wall. A deadman is a tie that is placed at right angles to the ties that form the wall. It serves as an anchor to keep the wall from collapsing. Such ties are placed between the regular wall ties either in even rows (Figure 4-3) or randomly (Figure 4-4).

Deadmen will be used in the examples in this section every fourth row and between every two ties. The number of deadmen needed varies depending on the person constructing the wall. Keep this in mind as you are shown by an instructor or crew supervisor how to construct a

Figure 4-3

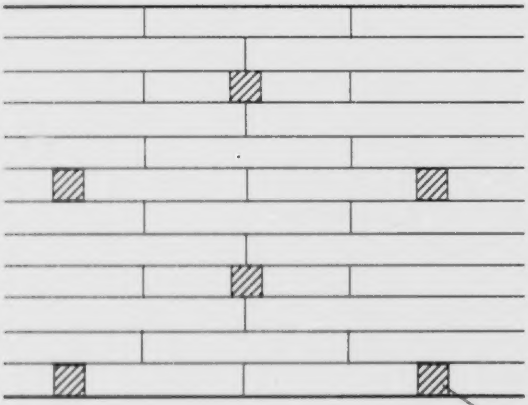
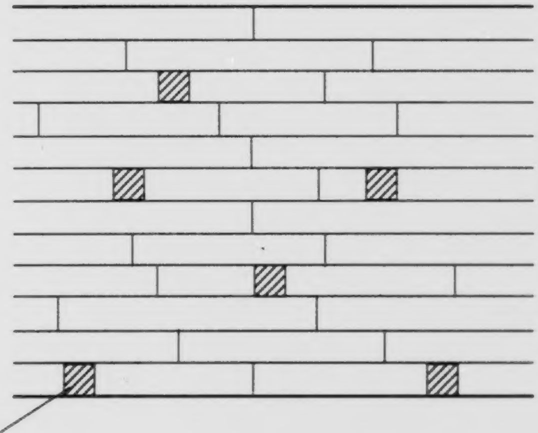


Figure 4-4



wall. As a foundation, place one deadman at each end of the bottom row to keep the wall firmly in place. When calculating the number of deadmen needed for a project, always **add one** for the bottom row.

Certain soils you are landscaping in are somewhat unstable and tend to slip or slide down the slope. You should learn both soil type and slope before you can determine the length of deadmen needed to hold the wall in place. Deadmen may be full-length ties, half-length ties, or even smaller ties. If you estimate every fourth row or every set of three ties vertically, and every two sets of ties horizontally, you will find that one deadman is needed –

- every 18 square feet for the 6' landscape tie.
- every 24 square feet for the 8' landscape tie.

Steps to finding the number of ties needed for a wall project:

1. Calculate the area of the face of the wall.
2. Calculate the number of ties for the face.

area of face ÷ area of the face of one of the ties used = number of ties for the face

3. Find the number of deadmen needed.

area of the face ÷ area allowed for deadmen for the tie being used + 1 tie for the bottom row = number of deadmen needed

4. Find number of ties needed for the project.

   The sum of part 2 and part 3 is the number of ties needed.

Example 1 (Figure 4-5)

Using landscape ties 6 feet long, construct a retaining wall 36 feet long and 4 feet high.

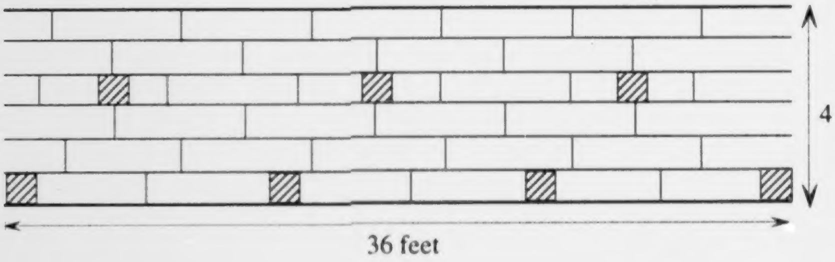


Figure 4-5

- area of the face 36 ft x 4 ft = 144 sq ft
- ties for the face 144 sq ft ÷ 3 sq ft = 48 ties
- deadmen 144 sq ft ÷ 18 sq ft = 8 ties + 1 tie = 9 ties
- total ties for the project 48 + 9 = 57 ties

Example 2

Using landscape ties 8 feet long, construct a retaining wall to cover an area 48 feet long by 8 feet high.

- area of the face 38 ft x 8 ft = 384 sq ft
- ties for the face 384 sq ft ÷ 4 sq ft. = 96 ties
- deadmen 384 sq ft ÷ 24 sq ft = 16 ties + 1 tie = 17 ties
- total ties for the project 96 + 17 = 113 ties

Perimeter Use

Landscape ties are also used for edging around gardens and other types of plots. Such ties are laid end to end to form the edging. No deadmen are used.

Steps to finding the number of ties needed for an edging project:

1. Calculate the perimeter of the space.
2. Find the number of ties needed.

perimeter ÷ the length of the tie being used = number of ties needed

Example 3 (Figure 4-6)

How many 8-foot landscape ties lying end to end are needed for the perimeter of this plot?

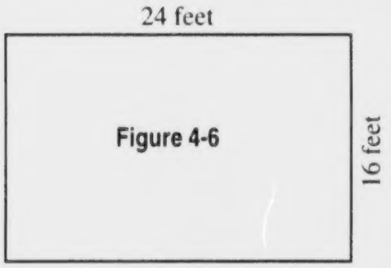


Figure 4-6

- perimeter:
  24 ft + 16 ft + 24 ft + 16 ft = 80 feet
- number of ties: 80 ft ÷ 8 ft = 10 ties

Example 4

How many 6-foot landscape ties lying end to end are needed for the perimeter of a rectangular garden 40 feet long by 20 feet wide?

- perimeter: 40 ft + 20 ft + 40 ft + 20 ft = 120 feet
- number of ties: 120 ft ÷ 6 ft = 20 ties

Example 5 (Figure 4-7)

Use 6-foot landscape ties to build this retaining wall.
Note: The total drop is 1 foot (6 ft – 5 ft).

- area of the face:

  Area A = 18' x 1' = 18 sq ft

  Area B = 30' x 5' = 150 sq ft

  Total 168 sq ft

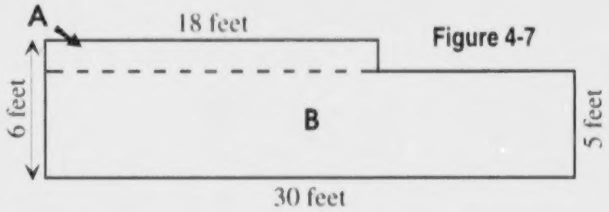


Figure 4-7

- ties for the face: 168 sq ft ÷ 3 sq ft = 56 ties
- deadmen: 168 sq ft ÷ 18 sq ft = 9.3 *or* 10 10 + 1 = 11 ties
  (You can't buy a partial tie.)
- total ties for wall: 56 + 11 = 67 ties

Example 6 (Figure 4-8)

Use 8-foot landscape ties to build this retaining wall. (Assume that the drops are of equal depth.)

Note: The total drop is 1 foot (4 ft – 3ft).

1 foot ÷ 2 drops = .5 foot

X = 4 ft – .5 ft = 3.5 feet

- area of the face:

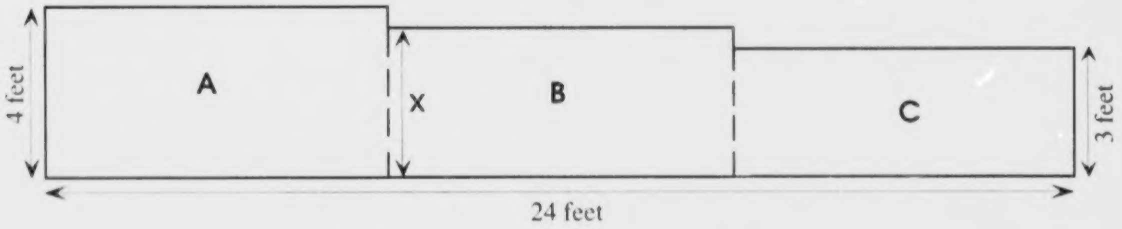
  Area A = 4' x 8' = 32 sq ft

  Area B = 3.5' x 8' = 28 sq ft

  Area C = 3' x 8' = 24 sq ft

  Total 84 sq ft

Figure 4-8

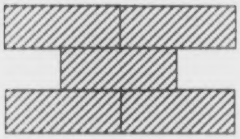


- ties for the face: 84 sq ft ÷ 4 sq ft = 21 ties
- deadmen: 84 sq ft ÷ 24 sq ft = 3.5 *or* 4 4 + 1 = 5 ties
- total ties for wall: 21 + 5 = 26 ties

Building Patios

Many different materials are available today for building patios. Some of the more common are brick, block, concrete pavers, granite, flagstone, and field rock.

Some materials, like granite, flagstone, and field stone, are sold by weight (tonnage). Others are sold by volume or cubic content and will not be discussed in this text. You can consult companies that carry the latter type of materials if you plan a project using them. They will provide you with charts and current prices.



Bricks - The common building brick, either new or used, measures 4 inches by 8 inches. (Actually, a brick is slightly smaller, to allow for mortar, but we will use the 4" x 8" dimension.)

Patio blocks - These come in a range of sizes. In the examples which follow, we will use three sizes:

a) 8" x 16" block that has an area of 128 square inches

b) 14" square block that has an area of 196 square inches

c) 18" square block that has an area of 324 square inches

Most areas to be covered, however, are measured in square feet. You will find it helpful to convert the area of each of these blocks to square feet. Remember that 1 square foot = 144 square inches.

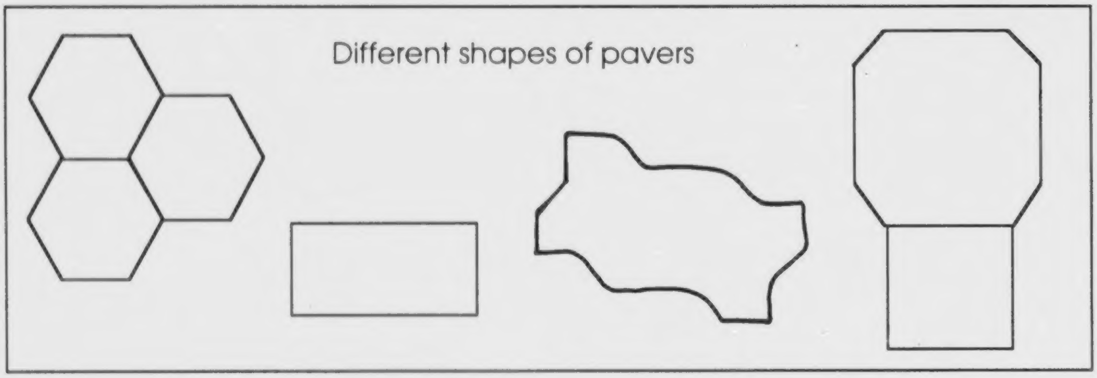
a) 8" x 16" = 128 sq in. ÷ 144 sq in. = .89 sq ft

b) 14" x 14" = 196 sq in. ÷ 144 sq in. = 1.36 sq ft

c) 18" x 18" = 324 sq in. ÷ 144 sq in. = 2.25 sq ft

Concrete pavers - These are available in a variety of shapes from rectangular to octagonal (Figure 4-9). The rectangular pavers, which measure exactly 4" x 8", will be used in these examples.

Figure 4-9



How can you determine the number of blocks, bricks, or pavers needed for a project? First, find the area of the section to be blocked, bricked, or paved. Then divide this area by the square footage of the paving material.

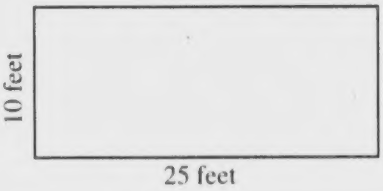
Example 1 (Figure 4-10)

This lot is to become a brick patio. How many bricks will you need to complete the project?

- area of the lot 25 ft x 10 ft = 250 sq ft
- area of one brick 8" x 4" = 32 sq in. *or* .22 sq ft
- bricks needed 250 sq ft ÷ .22 sq ft = 1136.4 *or* 1137

(You can't buy a partial brick.)

Figure 4-10



Example 2 (Figure 4-11)

Find the number of patio blocks 8" x 16" needed to construct the patio shown.

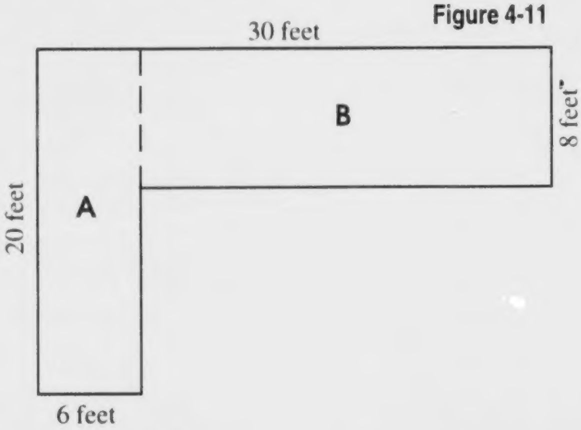
- Area A = 6' x 20' = 120 sq ft

  Area B = 24' x 12' = 288 sq ft

  Total area = 408 sq ft
- area of one 8" x 16" block is .89 sq ft
- blocks needed

  408 sq ft ÷ .89 sq ft = 458.4 *or* 459

Figure 4-11



The number of concrete pavers needed for a project is figured in a slightly different way.

One square foot of area is covered by 4.5 pavers.

To calculate the number of pavers needed for a job, you must again find the area of the space to be covered. When you know this area, multiply it by 4.5 to determine the number of pavers needed.

Example 3 (Figure 4-12)

Use rectangular pavers (4" x 8") to install this walk.

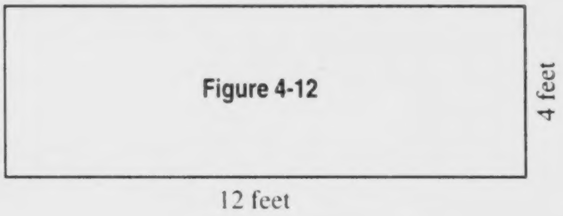


Figure 4-12

- area = 4' x 12' = 48 sq ft
- pavers needed 48 x 4.5 = 216 pavers

Mulch, Soil, and Stone Calculations

Whether you are applying mulch to an area, adding soil to an annual bed, or covering a driveway with crushed stone, you are working with three dimensions: length, width, and depth. Mulch or soil is the most common material you will be applying during a landscape project. Before you can calculate the amount of material you will need for the project, you must know not only the area to be covered, but how deep the material should be. So these calculations involve length, width, and depth. In Chapter 1 this calculation was called volume. Here, too, before applying mulch, soil, or stone, you need to calculate the volume of the space to be filled.

Example 1 (Figure 4-13)

This shrub bed is part of a larger landscape design. The landscaper wants 4 inches of cypress mulch applied to the bed. How much mulch will you need to order?

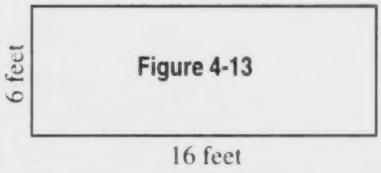


Figure 4-13

- volume = area of bottom x height (height becomes *depth* here)

  = 16 ft x 6 ft x 4 inches

  = 16 ft x 6 ft x $^{4}/_{12}$ ft

volume = 32 cu ft

Because mulch is sold by the cubic yard, the final figure needs to be converted to this measure. Remember that 1 cubic yard = 27 cubic feet.

32 cu ft ÷ 27 cu ft = 1.18 *or* 1.2 cu yd

Note: In the landscaping industry, "cubic yard" is typically shortened to simply "yard." If you hear that a truck carries "6 yards" of mulch, you will then understand that the truck carries 6 cubic yards of mulch.

Example 2 (Figure 4-14)

A crushed stone border 1.5 feet wide is to be installed around a reflecting pool. If the border of stones is to be 2 inches deep, how many yards (cubic yards) of stone should you order delivered to the site?

- area of stone = area of large circle – area of small circle

  = (3.14 x 6.5' x 6.5') – (3.14 x 5' x 5')

  = 132.665 sq ft – 78.5 sq ft

  = 54.165 sq ft

- volume = area of bottom x height (depth in this case)

  = 54.165 sq ft x 2 inches

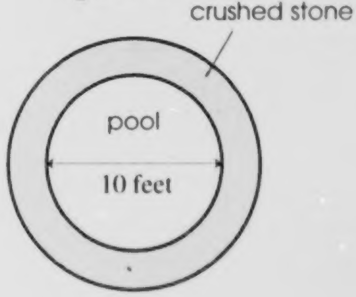
  = 54.165 sq ft x $\frac{2}{12}$ ft

  = 9.0275 cu ft

- Convert the answer to cubic yards.

  9.0275 cu ft ÷ 27 cu ft = .33 cu yd

Figure 4-14



Example 3

The city removed a dead tree along with the root system from a local park. This removal left a 4-foot-square hole 2.5 feet deep. To fill this hole, how many yards of soil must the city have hauled in?

- volume = area of bottom x height (depth)

  = 4 ft x 4 ft x 2.5 ft

  = 40 cu ft

- Convert the answer to cubic yards.

  40 cu ft ÷ 27 cu ft = 1.48 *or* 1.5 cu yd

Rootballs - We discussed in Chapter 2 how to find the volume of a sphere. Remember that the formula is:

volume of sphere (ball) = 4/3 x π x radius x radius x radius

You will need this formula to calculate the amount of soil in a root ball when balling and burlapping shrubs or trees. In most cases, you will have to make a rough estimate of the diameter of the shrub or tree because it is impractical to measure each shrub or tree being balled and burlapped.

One estimate commonly used is the following:

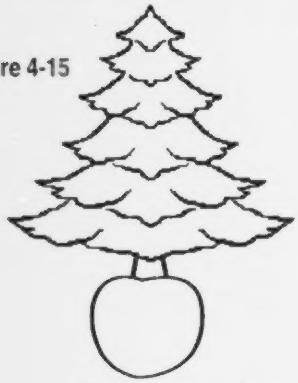
A cubic foot of soil weighs about 110 pounds.

This is, of course, an average - an "educated guess" - because soil weights vary according to the make-up of the soil - the percentages of sand, silt, clay, and the amount of other ingredients like peat or water.

Example 4 (Figure 4-15)

What is the volume of the root ball of this evergreen? How much does it weigh?

Figure 4-15



diameter = 4 feet

✿ volume of ball $= \frac{4}{3} \times \pi \times 2\text{ ft} \times 2\text{ ft} \times 2\text{ ft}$

$= 33.49$ *or* 33.5 cu ft

✿ Use a proportion to calculate the weight.

$$\frac{1\text{ cu ft}}{110\text{ lb}} = \frac{33.5\text{ cu ft}}{?}$$

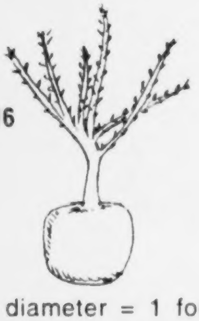
$$? = \frac{110\text{ lb} \times 33.5\ \cancel{\text{cu ft}}}{1\ \cancel{\text{cu ft}}}$$

$$? = 3685\text{ lb}$$

Example 5 (Figure 4-16)

How much soil is contained in the root ball of this shrub? How much does it weigh?

Figure 4-16



diameter = 1 foot

✿ volume of ball $= \frac{4}{3} \times \pi \times .5\text{ ft} \times .5\text{ ft} \times .5\text{ ft}$

$= .52$ *or* $.5$ cu ft

✿ weight of ball $= \frac{1\text{ cu ft}}{110\text{ lb}} = \frac{.5\text{ cu ft}}{?}$

$$? = \frac{110\text{ lb} \times .5\ \cancel{\text{cu ft}}}{1\ \cancel{\text{cu ft}}}$$

$$? = 55\text{ lb}$$

Example 6 (Figure 4-17)

How many cubic feet of soil are there in the root ball of this flowering crab tree?

- First, convert the radius (4.5 inches) to feet.
  $4.5 \div 12 = .375$ ft
- volume of ball $= \frac{4}{3} \times \pi \times .375 \times .375 \times .375$
  $= .22$ *or* $.2$ cu ft

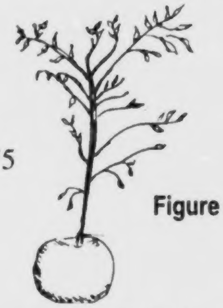


Figure 4-17

Many landscapers recommend the use of new fill soil when planting shrubs or trees. A guideline usually followed is this:

> **Dig the pit** for the tree or shrub **1.5 times the diameter** of the tree or shrub.

(We assume that the pit is a sphere like the root ball, only larger.)

Steps to finding the amount of fill soil needed when planting a tree or shrub:

1. Find the diameter of the pit.

   shrub or tree diameter x 1.5 = diameter of pit

2. Find amount of soil the pit can hold.

   $\frac{4}{3} \times \pi \times$ radius x radius x radius = amount of soil pit can hold

3. Find the amount of soil in the root ball.

   $\frac{4}{3} \times \pi \times$ radius x radius x radius = amount of soil in root ball

4. Find amount of fill soil.

   soil in pit – soil in root ball = amount of fill soil needed

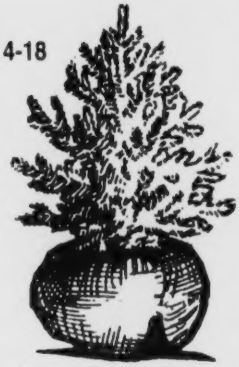
5. Calculate the answer in cubic yards.

   number of cu ft $\div$ 27 cu ft = cubic yards

Example 7 (Figure 4-18)

How much soil (cu yd) will you need to plant a blue spruce that has a root ball 18" in diameter?

Figure 4-18



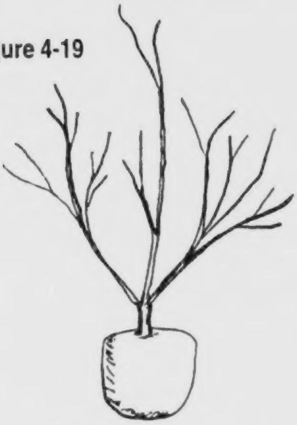
diameter = 18 inches

1. diameter of pit = 18" x 1.5 = 27"
   27 ÷ 12 = 2.25 ft
2. soil in pit = $\frac{4}{3}$ x π x 1.125 x 1.125 x 1.125 = 5.96 cu ft
3. soil in root ball = $\frac{4}{3}$ x π x .75 x .75 x .75 = 1.77 cu ft
4. fill soil = 5.96 cu ft – 1.77 cu ft = 4.19 cu ft
5. in cubic yards = 4.19 cu ft ÷ 27 cu ft = .16 *or* .2 cu yd

Example 8 (Figure 4-19)

How much soil will you need to plant this pin oak?

Figure 4-19



diameter = 15 inches

1. diameter of pit = 15" x 1.5 = 22.5"
   22.5 ÷ 12 = 1.875 ft
2. soil in pit = $\frac{4}{3}$ x π x .9375 x .9375 x .9375 = 3.45 cu ft
3. soil in root ball = $\frac{4}{3}$ x π x .625 x .625 x .625 = 1.02 cu ft
4. fill soil = 3.45 cu ft – 1.02 cu ft = 2.43 cu ft
5. cu yd = 2.43 cu ft ÷ 27 cu ft = .09 = .1 cu yd

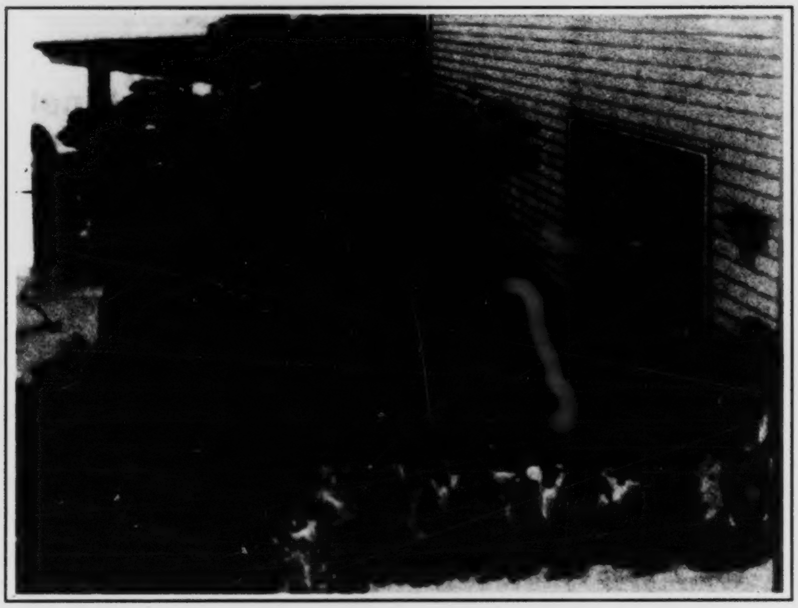
Building Decks

Decks have become one of the most popular additions homeowners make to their homes. As a landscaper, you can often include a deck in your design, to increase the living area of the customer as well as to enhance the beauty of the planned outdoor space. The design of a deck can range from a very simple plan (Figure 4-20) to a multi-level, complex design (Figure 4-21). The design examples used in this text will be of the simpler variety.

Wood treated with a special preservative is used for deck construction. Each deck is built with the following parts:

Figure 4-20

Figure 4-21



posts - used to support the deck. These are placed in holes filled with concrete. In areas of the country that experience freezing weather in winter, these holes must be dug below the frost line. Each post measures 4" by 4" and comes in a variety of lengths - as long as 16 feet and more.

collar - frame made of boards built around the posts to which the floor joists are attached. These boards measure 2" by 8" and come in a variety of lengths.

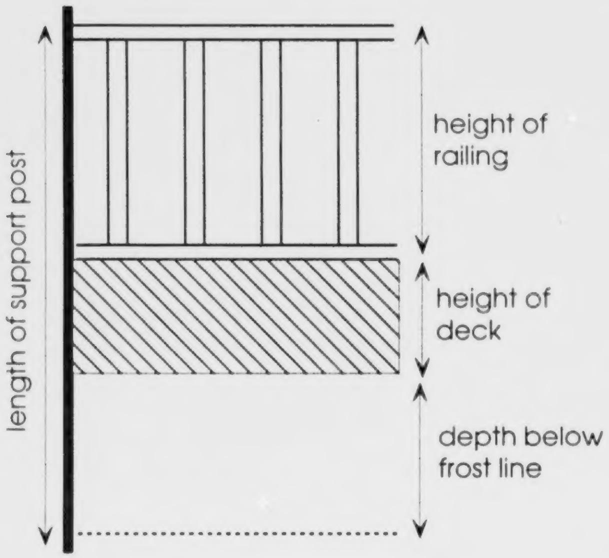
joists - boards attached at right angles to the outer frame that supports the floor boards. These are spaced 16 inches apart along the ***width*** or shorter side of the rectangular deck. Each measures 2" thick by 8" wide, and they come in a variety of lengths.

floor boards - used for the floor of the deck. Each is 5.25" wide and is laid along the ***length*** or longer side of the rectangular deck. They come in a variety of lengths - as long as 16 feet and more.

railing (optional) - used to finish the construction, depending on the design. Examples in this text will measure 3 feet high and the rails will be 6 inches apart.

The following calculations are used to determine the materials needed to build a deck.

Figure 4-22

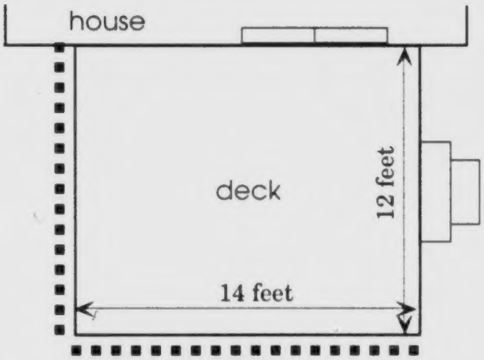


- posts: one at each corner
- length of the post: depth below frost line + height of deck + height of railing (if there is one) (Figure 4-22)
- collar: perimeter of deck ÷ length of board being used
- joists: width of deck ÷ 16"
- floor boards: length of deck ÷ 5.25"
- number of pieces of railing: total length to be railed ÷ space between each rail

Example 1 (Figure 4-23)

A client has asked Green Landscaping to prepare an estimate for building a rectangular deck 12 feet by 14 feet off the sliding doors of this house. The deck will have 3-foot railings as shown. ■■■■■■■ The frost line here is about 36 inches below the surface of the ground. The deck will stand 4 feet above the surface of the ground.

Figure 4-23


house
deck
12 feet
14 feet

When you are planning a deck, you must make the most economy of time and labor. Both 12-foot and 14-foot boards will be used for building this deck. Begin construction by placing a post at each corner of the deck. Attach a collar of boards to the posts (Figure 4-24). Then attach the floor joists to this collar at intervals of 16 inches along the width of the deck (Figure 4-25). Place the floor boards on top of the joists at right angles to them (Figure 4-26).

Figure 4-24

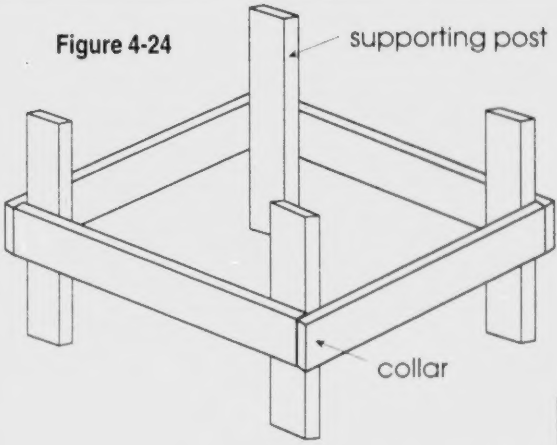

supporting post
collar

Figure 4-26

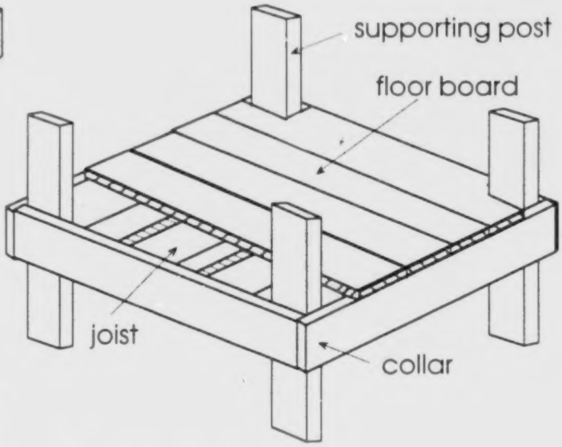
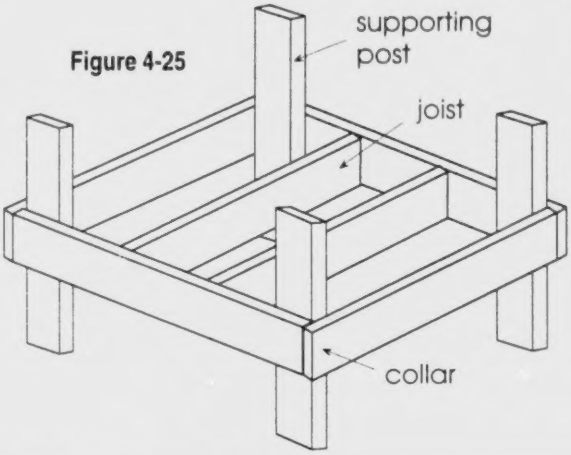

supporting post
floor board
joist
collar

Figure 4-25


supporting post
joist
collar

The materials you will need for the deck are the following:

- posts: 4
- length of posts needed: 36" (or 3') + 4' + 3' = 10'
- collar: 14' + 12' + 14' + 12' = 52'
  52' ÷ 12' = 4.3 *or* 5 boards
  52' ÷ 14' = 3.7 *or* 4 boards

  12' or 14' board can be used. Cost will determine which should be used.
- joists: 12' ÷ 16" (Change feet to inches before dividing)
  144" ÷ 16" = 9 boards (14' long)
- floor boards: 14' ÷ 5.25" (Change feet to inches before dividing)
  168" ÷ 5.25" = 32 boards (12' long)
- number of pieces of railing:
  14' + 12' ÷ 6" (Change inches to feet: 6" to .5 ft)
  26' ÷ .5' = 52 rails

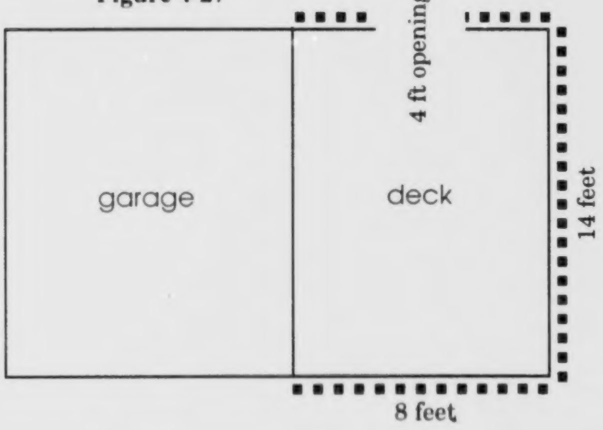
Example 2 (Figure 4-27)

Prepare the materials list for a deck to be built behind this garage. This deck will be constructed in a region where the frost line is 24 inches below the surface of the ground. The deck is to be 3 feet above ground level. It will have 3-foot-high railings. 10' and 14' boards will be used.

The materials you will need to build this deck include the following:

- posts: 4
- length of posts needed: 24" (or 2') + 3' + 3' = 8'

Figure 4-27



- collar: use 10' boards:
  8' + 14' + 8' + 14' = 44'
  44' ÷ 10' = 4.4 *or* 5 boards
- joists: 8' ÷ 16"
  96" ÷ 16" = 6 boards (14' long)
- floor boards: 14' ÷ 5.25"
  168" ÷ 5.25" = 32 boards (10' long)
- number of pieces of railing
  8' + 14' + 4' = 26'
  26' ÷ 6" (Change 6" to .5 ft)
  26' ÷ .5' = 52 rails

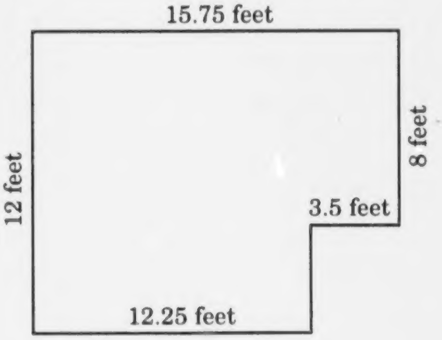
Example 3 (Figure 4-28)

Find the materials needed to build this deck. The deck is to be constructed 1 foot above the ground in a region where the frost line is 30 inches below ground surface. There will be no railing.

Following are the materials you will need to build this deck:

- posts: 6
- length of posts needed: 30" (or 2.5') + 1' = 3.5'
- collar: use 12' boards:
  12' + 15.75' + 8' + 3.5' + 4' + 12.25' = 55.5'
  55.5' ÷ 12' = 4.625 *or* 5 boards
- joists: use 16' and 14' boards:
  - number of 16' boards: 8' ÷ 16"
    96" ÷ 16" = 6 boards
  - number of 14' boards: 4' ÷ 16"
    48" ÷ 16" = 3 boards
- floor boards: use 12' boards and 8' boards:
  - number of 12' boards: 12.25' ÷ 5.25"
    147" ÷ 5.25" = 28 boards
  - number of 8' boards = 3.5' ÷ 5.25"
    42" ÷ 5.25" = 8 boards

Figure 4-28



Construction with Wall Stone

Wall stone, a concrete product, is gaining popularity as a building material for retaining walls, planters, landscape steps, garden edging, and tree rings. The product comes in units of different sizes and shapes. Three of these (Figures 4-29 to 4-31) are:

1) wedged unit

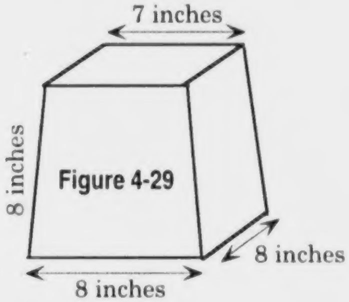


Figure 4-29

Covers .42 sq ft
2.4 units per sq ft

2) square unit

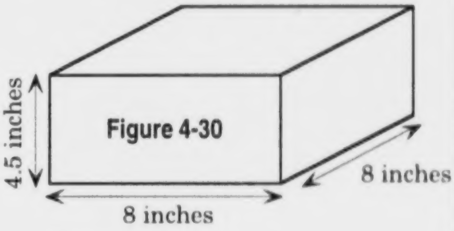


Figure 4-30

Covers .25 sq ft
4 units per sq ft

3) rectangular unit

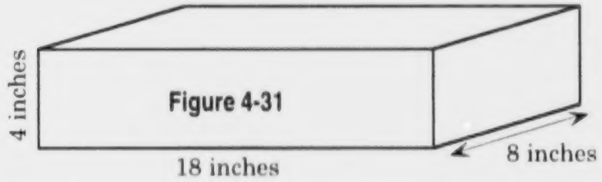


Figure 4-31

Covers .5 sq ft
2 units per sq ft

The different unit shapes allow for the construction of curved walls and rings (Figure 4-32) as well as straight wall projects (Figure 4-33).

Figure 4-32

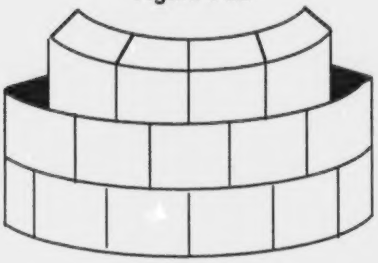
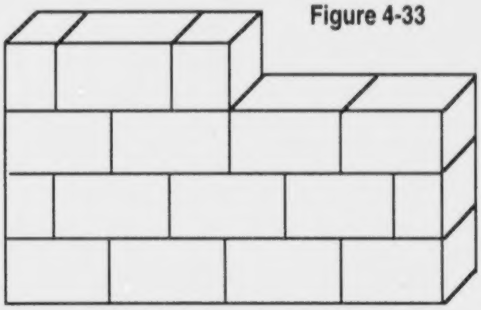


Figure 4-33



Before you build a wall stone project, you must prepare a base for the wall. This involves excavating a trench, compacting the soil that remains, and adding a granular fill like crusher run gravel, which also must be compacted. Where poor soil conditions or excessive water exists, a drain or weeping tile must also be installed.

Each row of stones in the wall is called a **course**. The wall in Figure 4-32 has 3 courses; the wall in Figure 4-33 has 4 courses.

Steps to follow to determine the amount of stone wall units needed for a project:

1. Find the amount of fill needed for the base.

   (length in ft x width in ft x height in ft) ÷ 27 = cu yd

2. Find the area of the face of the wall. If the wall has more than one height (as in Figure 4-33), calculate the **average** of the heights.

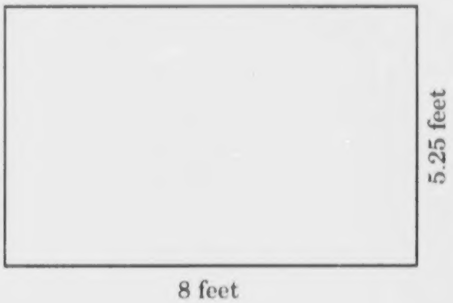
3. number of units needed = area ÷ square feet per unit

Example 1 (Figure 4-34)

Find the number of wall units, 4.5" by 8", needed to build this retaining wall. Use a trench 6" deep by 12" wide for the base.

- fill: 6" x 12" x 8'
  (Convert inches to feet)
  .5' x 1' x 8' = 4 cu ft
  4 cu ft ÷ 27 cu ft = .1 cu yd
- area of face:
  5.25' x 8' = 42 sq ft
- one 4.5" by 8" unit covers $^{36}/_{144}$ sq ft
  $^{36}/_{144}$ sq ft = .25 sq ft
  units needed:
  42 sq ft ÷ .25 sq ft = 168 units

Figure 4-34



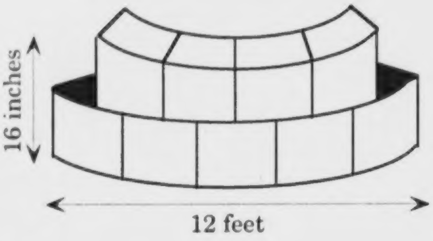
Example 2 (Figure 4-35)

Find the number of wedged stones needed to build the terrace wall shown. Use a trench 12" deep by 16" wide for the base.

- fill: 12" x 16" x 12'
  (Convert inches to feet)
  1' x $^{16}/_{12}$' x 12' = 16 cu ft
  16 cu ft ÷ 27 cu ft = .6 cu yd

  Though this is a curved surface, the calculation will treat it as a rectangular surface.

Figure 4-35



(continued)

- area: 12' x 16"
  12' x $\frac{16}{12}$' = 16 sq ft

- one wedged unit covers an area of .42 sq ft
  units needed: 16 sq ft ÷ .42 sq ft = 38.09 *or* 39 units
  (*Note:* Here you might get by using 38 units because the remainder is so small.)

Example 3 (Figure 4-36)

For this wall, find the number of 4" by 18" rectangular stones needed. Use a trench 6" deep by 12" wide for the base.

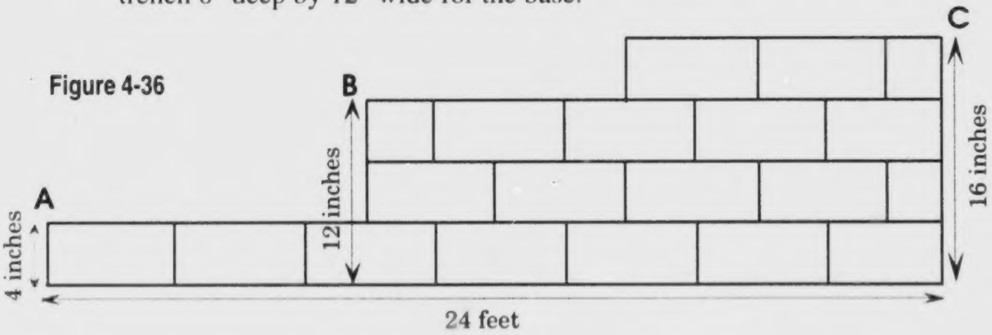


Figure 4-36

- fill: 6" x 12" x 24'
  .5' x 1' x 24' = 12 cu ft
  12 cu ft ÷ 27 cu ft = .4 cu yd

  Because the wall has more than one height, an average of three heights will be used to calculate the area of the face.

- average height = (A + B + C) ÷ 3
  (4" + 12" + 16") ÷ 3 = 32"
  32" ÷ 3 = 10.7"

- area of the face:
  $\frac{10.7''}{12'}$ x 24' = 21.4 sq ft

- one 4" x 18" stone covers an area of $\frac{72}{144}$ sq ft
  $\frac{72}{144}$ sq ft = .5 sq ft
  units needed: 21.4 sq ft ÷ .5 sq ft = 42.8 *or* 43 units

Example 4 (Figure 4-37)

Find the number of 4.5" by 8" units needed to construct this terrace. Use a trench 6" deep by 15" wide for the base.

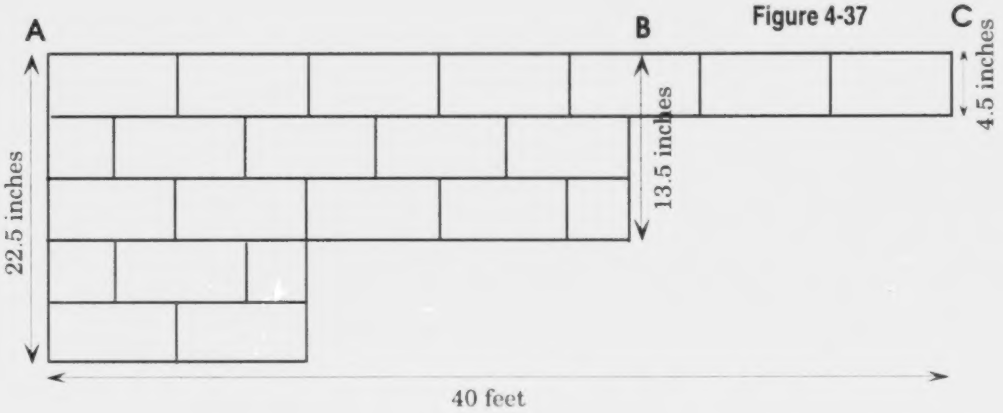


Figure 4-37

- fill: 6" x 15" x 40'
  .5' x 1.25' x 40' = 25 cu ft
  25 cu ft ÷ 27 cu ft = .9 cu yd

  Because the wall has more than one height, an average of three heights will be used to calculate the area of the face.

- average height = (A + B + C) ÷ 3
  (22.5" + 13.5" + 4.5") ÷ 3 = 40.5"
  40.5" ÷ 3 = 13.5"

- area of the face:

  $\frac{13.5"}{12'}$ x 40' = 45 sq ft

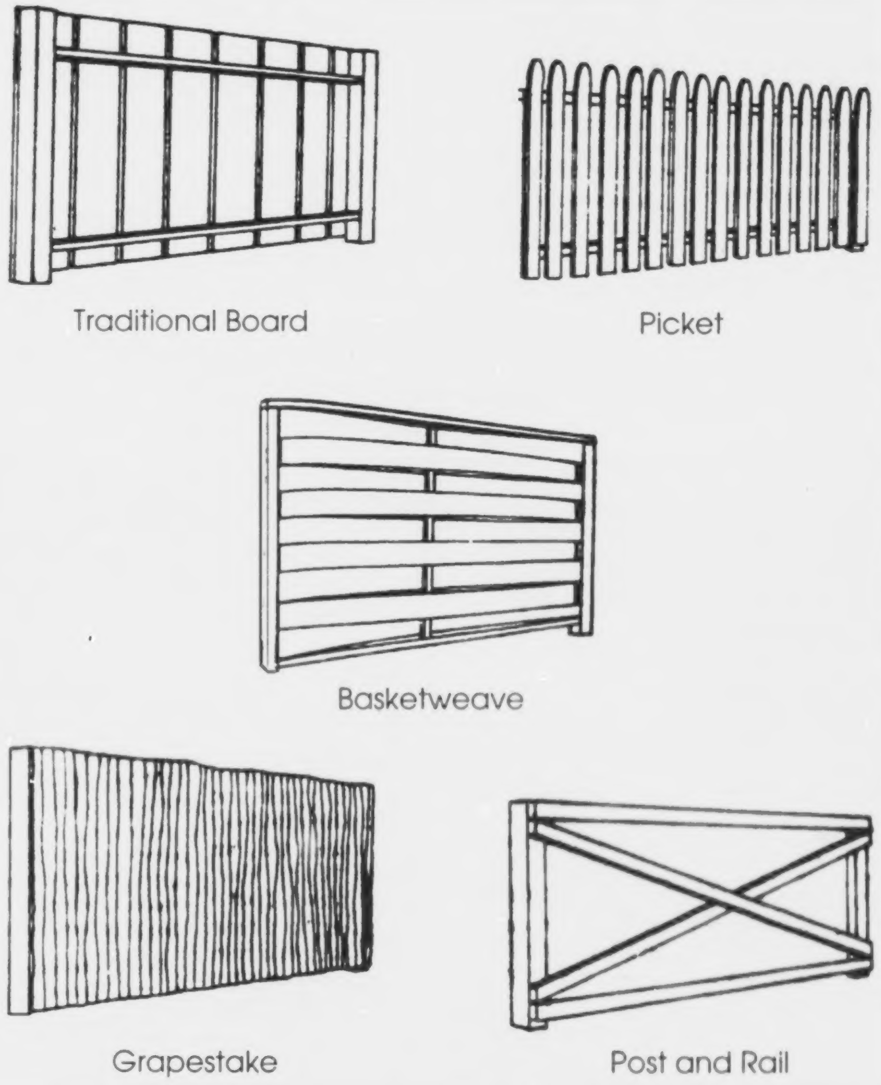
- one 4.5" by 8" stone covers $\frac{36}{144}$ sq ft
  $\frac{36}{144}$ sq ft = .25 sq ft
  units needed: 45 sq ft ÷ .25 sq ft = 180 units

Fencing

Calculating the fencing part of construction is easy. The real work comes when installation begins. Of course, calculation of the materials needed must be done before any work can be started.

There are several different types of fencing (Figure 4-38). Most fencing is sold in sections 8 feet long. One exception is split-rail fencing, which comes in sections 10 feet long.

Figure 4-38



Traditional Board

Picket

Basketweave

Grapestake

Post and Rail

Steps to follow to determine the materials needed for constructing a fence.

1. Find the distance to be fenced (called a *run*).
2. To find number of sections needed, divide the distance by the width of one section of the desired fencing.
3. To find number of posts needed, use one for each section and add additional posts for each end of run.

   "End of run" refers to the end of the fence, where one additional post is needed to complete the fence, making it secure.

If there is a remainder when the perimeter is divided by one section of fencing, you must order an additional section and then cut down. Some split-rail fences can be split again, eliminating the need for the additional section.

When you are using shorter sections of fencing, if possible put the shorter section at a corner where it will give added strength to the fence. If there are shorter sections on adjacent sides, try to end up with a balanced appearance (Figure 4-39A).

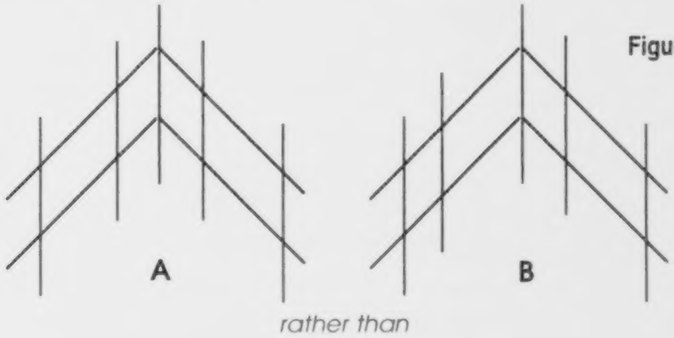


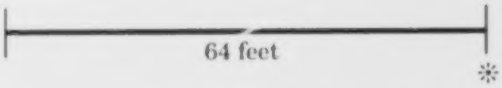
Figure 4-39

Example 1 (Figure 4-40)

Determine what materials you will need to construct this fence, using 8-foot fencing sections.

- run: 64'
- sections needed:
  64' ÷ 8' = 8 sections
- posts needed: 8 (one for each section) + 1 additional for end of run (⁜) = 9 posts

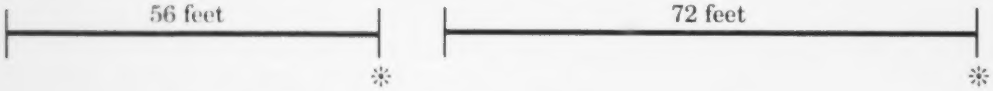
Figure 4-40



Example 2 (Figure 4-41)

Determine what materials you will need to construct this two-part fence, using 8-foot fencing sections.

Figure 4-41



- run: 72' + 56' = 128'
- sections needed: 128' ÷ 8' = 16 sections
- posts needed: 16 (one for each section) + 2 additional for end of runs (✻) = 18 posts

Example 3 (Figure 4-42)

Find the number of 10-foot sections and the number of additional posts needed to construct this fence.

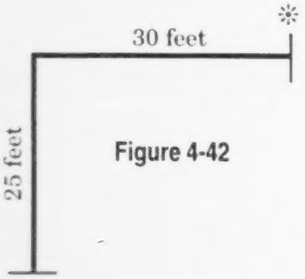


Figure 4-42

- run: 25' + 30' = 55'
- sections needed: 55' ÷ 10' = 5.5 *or* 6 sections
- posts needed: 6 (one for each section) + 1 additional for end of run (✻) = 7 posts

Example 4 (Figure 4-43)

How many 8-foot sections and posts are needed to construct this fence? Allow 4 feet for the gate opening.

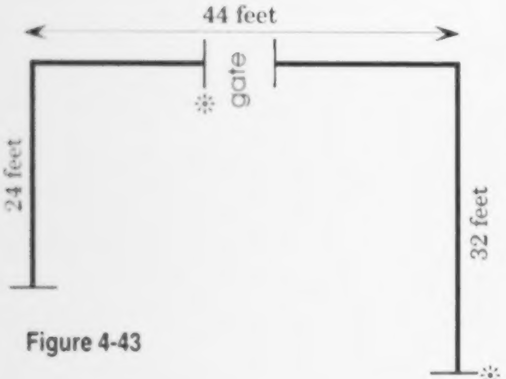


Figure 4-43

- run: (24' + 44' + 32') – 4' (gate) = 96'
- sections needed: 96' ÷ 8' = 12 sections
- posts needed: 12 (one for each section) + 2 additional for end of runs (✻) = 14 posts

Example 5 (Figure 4-44)

Determine the number of sections of 8-foot fencing and the number of additional posts needed to construct this fence. There is to be a 10-foot driveway gate, a 4-foot sidewalk gate in front, and another 4-foot sidewalk gate in back.

- run:
  (100' – 4') + 150' + (100' – 10' – 4') + 150'
  = 482'

- sections needed: 482' ÷ 8' = 60.25 *or*
  61 sections

- posts needed: 61 (one for each section) +
  3 additional for end of runs (❊) =
  64 posts

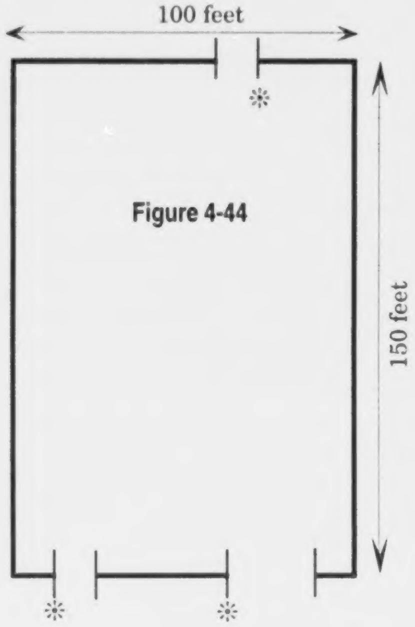


Figure 4-44

Chapter 4, Practice Set 1

Make the necessary calculations and write the correct answers in the spaces on the right.

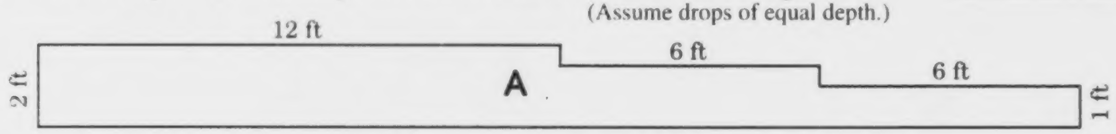
1. Find the number of 6-foot landscape ties that are needed to construct a rectangular retaining wall which is 40 feet long and 16 feet wide. ________

2. A customer is planning a 14-foot-square garden using 8-foot landscape ties as a border around it. How many ties will be needed if they are laid end to end? ________

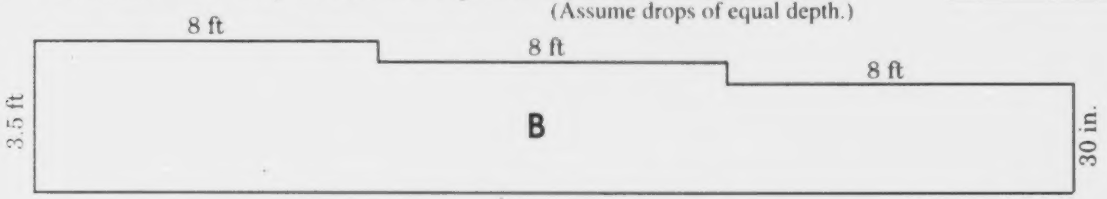
3. The dimensions for a rectangular retaining wall are 32 feet long by 2.5 feet wide. How many 8' ties are needed to construct two of these walls? ________

4. How many deadmen would be needed for a wall 32.5 feet long by 5 feet high using 6-foot landscape ties? ________

5. How many 6-foot landscape ties are needed to construct retaining wall **A**? ________
(Assume drops of equal depth.)

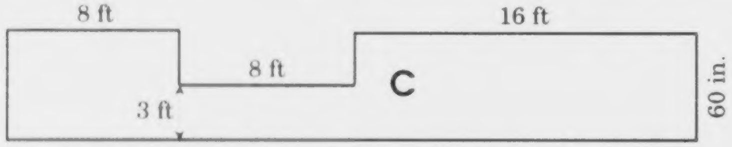


6. Determine how many 8-foot landscape ties are needed to build wall **B**. ________
(Assume drops of equal depth.)

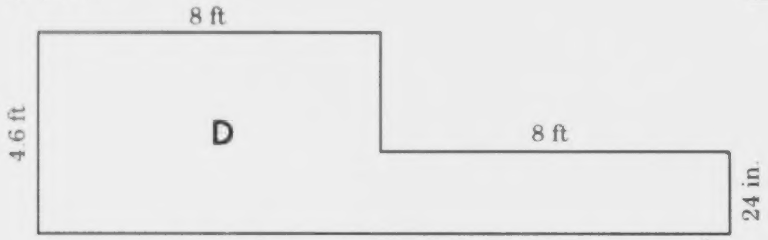


7. Figure the total number of 6-foot landscape ties that are needed for a rectangular wall 64 feet long and 5 feet high. ________

8. Determine how many 8-foot landscape ties are needed to construct wall **C**. ________



9. How many 8-foot landscape ties are needed to construct wall **D** if half-length deadmen will be used? ________



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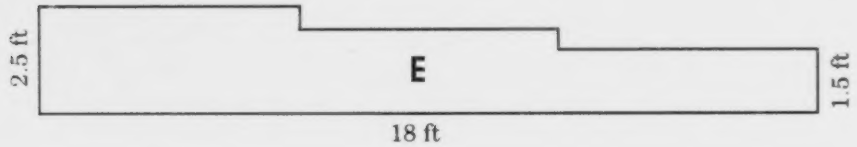
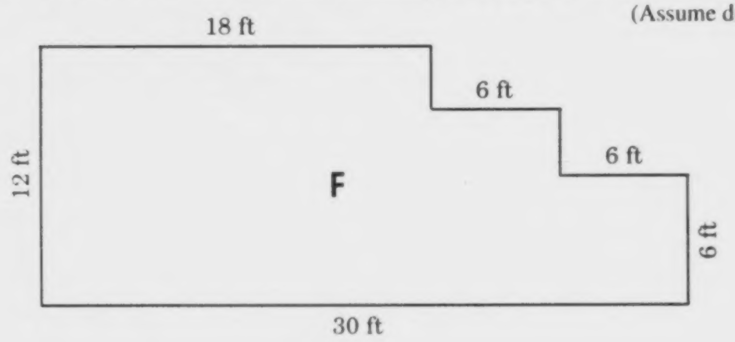
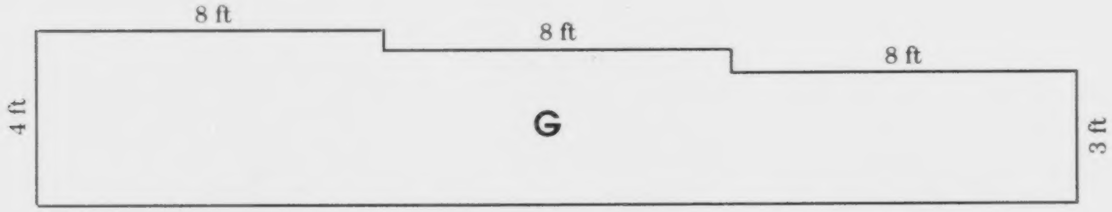
10. How many 6-foot landscape ties are needed to construct this retaining wall if deadmen 2 feet long are used? (Assume drops of equal depth.) ______



11. Find the number of 6-foot landscape ties needed to edge the garden in the diagram. (Assume drops of equal depth.) ______



12. How many 8-foot landscape ties and full-length deadmen are needed to construct this retaining wall? (Assume drops of equal depth.) ______



13. Complete by filling in the blanks.

Rectangular wall dimensions	Size of tie used	Number of ties needed for face	Number of half-length deadmen needed
33.5' by 5'	6 feet	a ______	b ______
32' by 2.5'	8 feet	c ______	d ______
24' by 6'	8 feet	e ______	f ______
20' by 4.5'	6 feet	g ______	h ______

Chapter 4, Practice Set 2

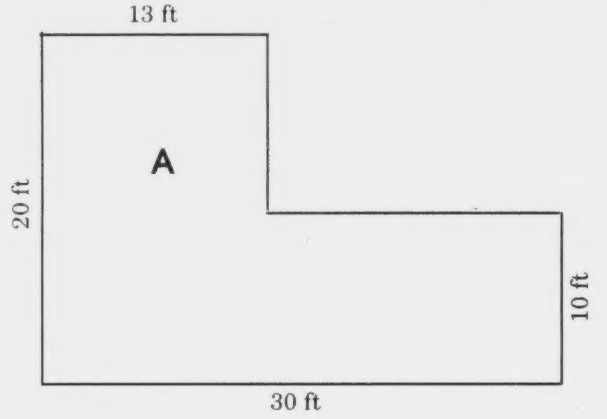
Make the necessary calculations and write the correct answers in the spaces on the right.

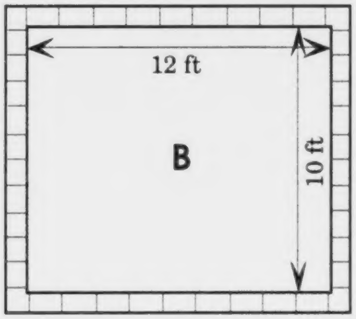
1. Find the number of bricks needed for a rectangular patio 9 feet by 12 feet. ____________

2. A customer would like a sidewalk 50 feet by 32 inches constructed of rectangular concrete pavers. How many pavers will you need? ____________

3. A homeowner wants a small area, 3 feet by 5 feet, behind the garage blocked or bricked for storage of trash cans. If an 18-inch-square block costs $1.99 and a brick costs $.25, which material would be more economical to install? ____________

4. Find the number of 8" x 16" patio blocks needed to install patio **A**. ____________

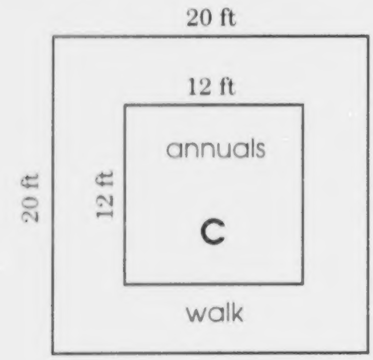




5. Plan a patio made of 14-inch-square patio block to cover rectangular area **B** 12 feet long by 10 feet wide. Around the perimeter, install bricks in a single row end to end. How many patio blocks and how many bricks will you need? ____________ ____________

6. Install 14-inch-square patio block around a rectangular swimming pool which measures 50 feet by 30 feet. The block should extend 7 feet on all sides of the pool. How many blocks will you need? ____________

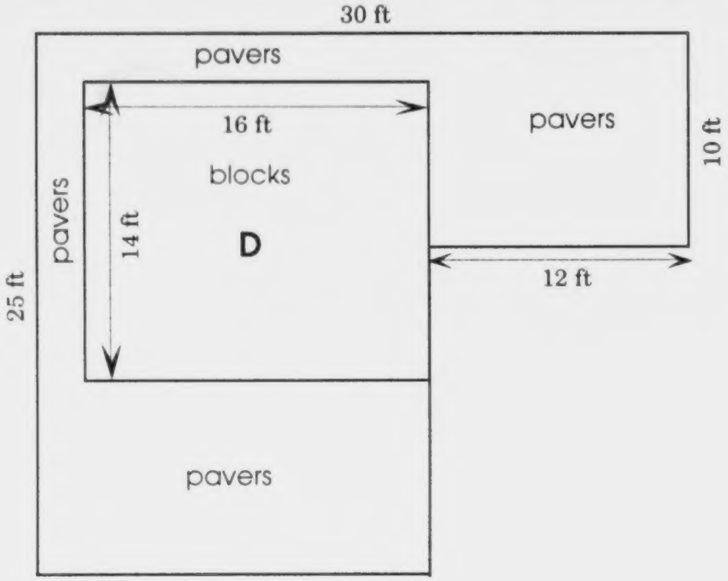
7. A customer hired Lowe's Landscaping to install a brick walk around the annual garden in **C**. How many bricks will the landscape workers need? ____________



(continued)

8. CJ's Garden Center has been hired to build patio **D**. Find the number of rectangular pavers and the number of 8" x 16" blocks needed for the job. ______________

____


30 ft
pavers
16 ft
pavers
10 ft
blocks
pavers
14 ft
D
12 ft
25 ft
pavers

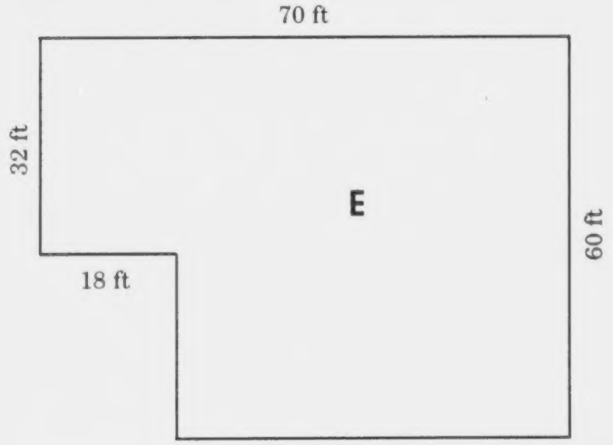
9. How many 18-inch-square blocks would be needed for the rectangular patio in Question 1? ______________

10. How many 8" x 16" patio blocks would be needed for the walk in Question 2? ______________

11. How many bricks would be needed for the patio in Question 4? ______________

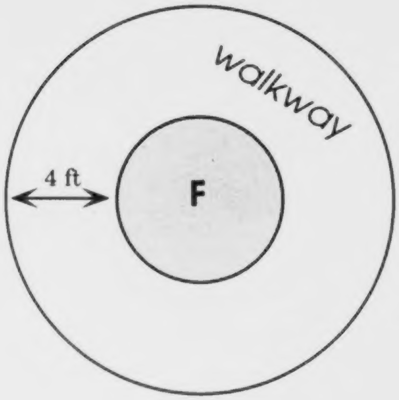
12. How many rectangular pavers would be needed for the pool project in Question 6? ______________

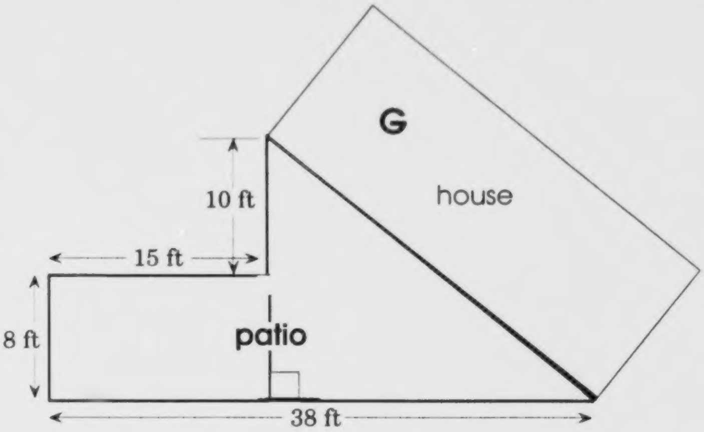
13. You are to cover area **E** with 18-inch-square patio blocks. How many will you need for the job? ______________


70 ft
32 ft
E
60 ft
18 ft

(continued)

14. Circular lily pond **F**, 5 feet in diameter, is to be encircled by a brick walkway 4 feet wide. How many bricks will you need for the walkway? ____________


walkway
4 ft
F

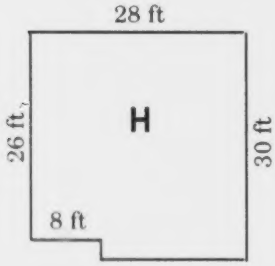

G
house
10 ft
15 ft
8 ft
patio
38 ft

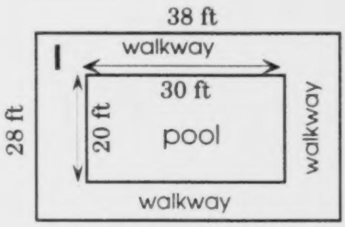
15. How many patio blocks 15 inches square will be needed to install the patio beside home **G**? ____________

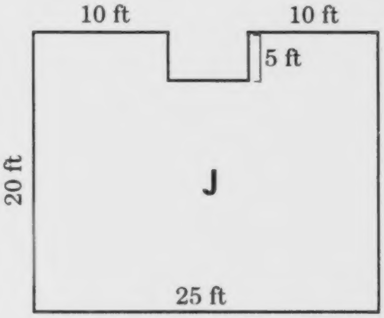
16. How many rectangular pavers would you need to install the patio in Question 13? ____________

17. How many rectangular pavers would you need to install the patio in Question 4? ____________

18. Fill in all the lettered blanks below for sketches **H, I,** and **J**.


28 ft
H
26 ft
30 ft
8 ft


38 ft
I
walkway
30 ft
28 ft
20 ft
pool
walkway
walkway


10 ft
10 ft
5 ft
20 ft
J
25 ft

H		I		J	
Building material	**Number needed**	**Building material**	**Number needed for walkway**	**Building material**	**Number needed for patio**
14" patio block	________ a	8" patio block	________ d	18" patio block	________ g
brick	________ b	brick	________ e	brick	________ h
rectangular pavers	________ c	rectangular pavers	________ f	rectangular pavers	________ i

Chapter 4, Practice Set 3

Make the necessary calculations and write the correct answers in the spaces on the right.

1. To fill a trench 100 feet by 2 feet by 1.5 feet, how many cubic yards of soil will you need? ____________

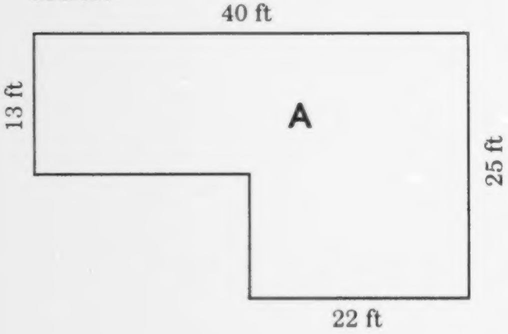
2. An area of 25 square feet is to be covered by 2 inches of bark mulch. A bag of bark mulch will cover 36 square feet to one-inch depth. Without breaking a bag, how many bags will you need? ____________

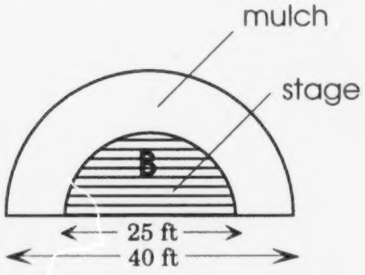
3. A circular flower bed with a diameter of 7 feet needs 8 inches of topsoil added to it. How many cubic yards are needed? ____________

4. How many cubic yards of crushed rock are needed to cover a driveway 12 feet by 35 feet to a depth of 4 inches? ____________

5. A tree has been removed from a lawn. The circular hole that is left, 5 feet in diameter and 3 feet deep, must be filled and levelled. How many cubic yards of fill dirt are required? ____________

6. How many cubic yards of cypress mulch, 3 inches deep, are needed for shrub bed **A**? ____________

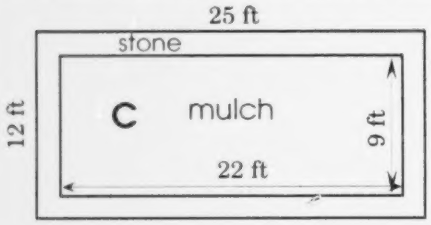




7. Because of rainy weather, the area in front of outdoor stage **B** must be covered with 6 inches of bark mulch. How many yards will be needed? ____________

8. A rectangular reflecting pool 8 feet by 12 feet has been removed from a garden site. The 3-foot-deep hole that is left must be filled and levelled with soil. How many cubic yards of soil will it take? ____________

9. Crushed stone is to be installed 5 inches deep in a uniform strip 18 inches wide around evergreen bed **C**. Also, hardwood mulch 3 inches deep is to be laid on the evergreen bed. How many cubic yards of each material are needed for the project?



____________ stone

____________ mulch

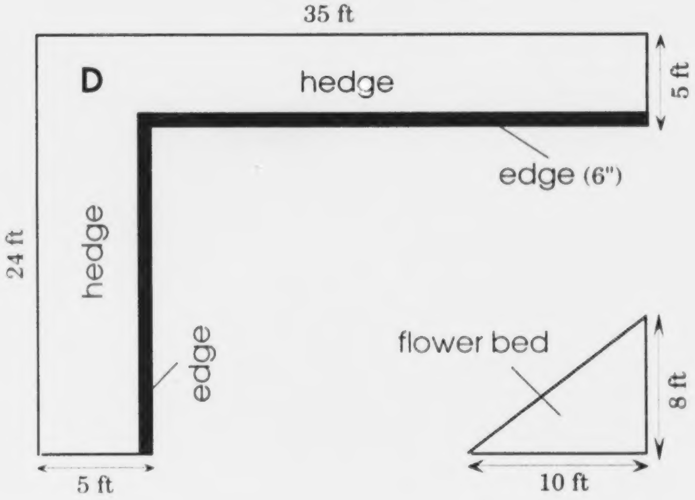
(continued)

10. Determine how many cubic yards of each material will be needed in design **D**

a) for 4 inches of mulch on the hedges. ____________

b) for 3 inches of stone for the edging, which is 6 inches wide. ____________

c) for 3 inches of topsoil on the flower bed. ____________



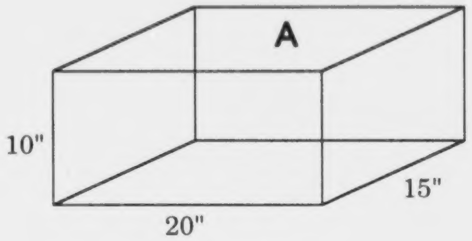
11. Determine the number of whole bags of mulch you will need for each of these examples (without breaking a bag). Fill in blanks **a – e**.

Area to be covered	Depth of mulch	1 bag covers (1 in. deep)	Number of bags needed	
75 sq ft	3 in.	30 sq ft	____________	a
150 sq ft	4 in.	24 sq ft	____________	b
100 sq ft	6 in.	36 sq ft	____________	c
275 sq ft	4 in.	30 sq ft	____________	d
190 sq ft	3 in.	24 sq ft	____________	e

Make the necessary calculations and write the correct answers in the spaces provided.

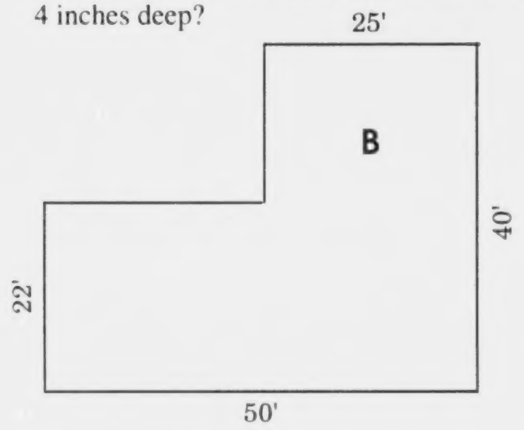
1. How many **cubic yards** of cypress mulch will you need for a circular flower garden that has a diameter of 18 feet? You are to apply the mulch 3 inches deep. ____________

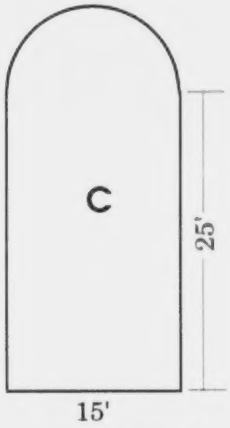
2. How many **cubic feet** of sand will you need to fill 75 flats like flat **A**? ____________



3. A hanging basket holds 400 cubic inches of supermix. How many **cubic yards** of supermix will be needed for 50,000 baskets? ____________

4. How many **cubic yards** of mulch will you need to cover flower bed **B** 4 inches deep? ____________

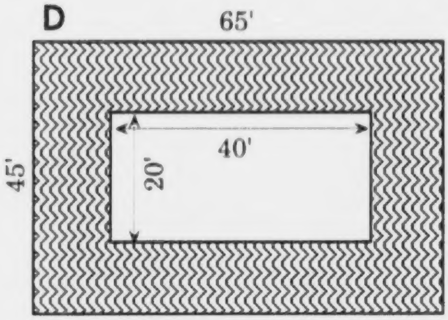


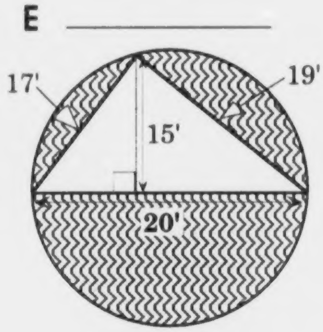


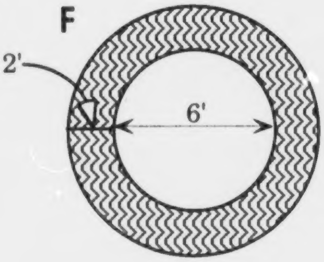
5. How many **cubic yards** of mulch will you need to cover shrub bed **C** to a depth of 6 inches? ____________

6. How many **cubic feet** of mulch will you need to cover the shaded portion of each of these flower beds if the mulch is –

- 5 inches deep in **D**? ____________
- 4 inches deep in **E**? ____________
- 3 inches deep in **F**? ____________







Chapter 4, Practice Set 5

Make the necessary calculations and write the correct answers in the spaces provided.

1. Boorwood Nursery has been hired to plant a landscape that is designed with the following:

Number	Shrub or Tree	Diameter of Root Ball
5	junipers	8 inches
3	dogwoods	10 inches
1	magnolia	15 inches
2	maples	14 inches

a) Can all these shrubs and trees be delivered at the same time on a truck that has a maximum load limit of 4000 pounds? ____________

b) How many cubic yards of soil will be needed for all the plantings? ____________

2. The root ball of a Norway spruce is 5 feet in diameter. What is its weight? ____________

3. How many cubic feet of soil are needed to plant a red oak tree that has a root ball 1.5 feet in diameter ? ____________

4. How many bird's-nest spruce trees can be delivered on a 2-ton truck if each tree has a root ball 8 inches in diameter? ____________

5. How many cubic yards of soil will be needed to plant four lilac bushes, each with a root ball diameter of 18 inches? ____________

6. Your landscaping company has been hired to move and transplant a holly bush with a root ball estimated to be 30 inches in diameter.

a) How much does the root ball weigh? ____________

b) How much soil will you need to transplant the bush? ____________

7. Find the number of (cubic) yards of soil needed to plant the following in a landscape design.

Number	Shrub or Tree	Diameter of Root Ball	Yards of Soil
2	mountain ash	7 inches	__________
1	flowering crab	14 inches	__________
5	euonymus	5 inches	__________

Total needed ____________

(continued)

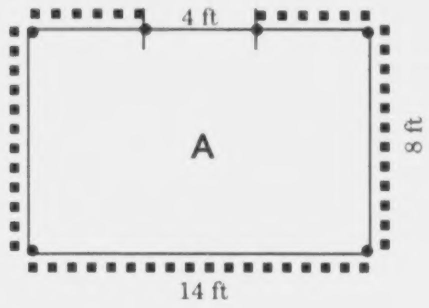
Chapter 4, Practice Set 5 *(page two)*

8. Complete the following table, filling in each lettered space.

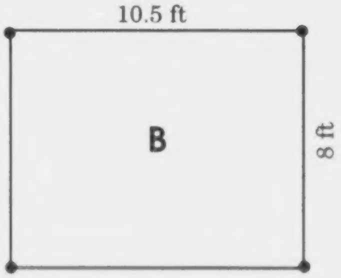
Tree or Shrub	Diameter of Root Ball	Cubic Feet of Soil Needed to Plant	Weight of Root Ball
arborvitae	6 inches	**a** ____________	**b** ____________
taxus yew	10 inches	**c** ____________	**d** ____________
hemlock	16 inches	**e** ____________	**f** ____________
maple	14 inches	**g** ____________	**h** ____________
spruce	17 inches	**i** ____________	**j** ____________
privet	5 inches	**k** ____________	**l** ____________
cotoneaster	8 inches	**m** ____________	**n** ____________
azalea	9 inches	**o** ____________	**p** ____________
buckeye	15 inches	**q** ____________	**r** ____________
willow	11 inches	**s** ____________	**t** ____________

Chapter 4, Practice Set 6

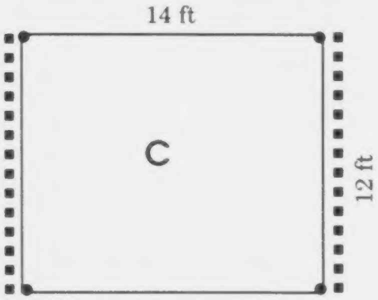
On a separate sheet of paper, make a list of the materials needed for each deck. Use the board lengths given for each example. (■ ■ ■ ■ ■ ■ ■ ■ ■ ■ indicates a railing 3' high)


4 ft
A
8 ft
14 ft

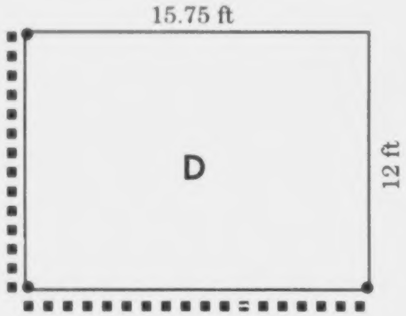
A 14 ft, 8 ft boards
2 ft above ground
railing has 4 ft opening
frostline at 2'



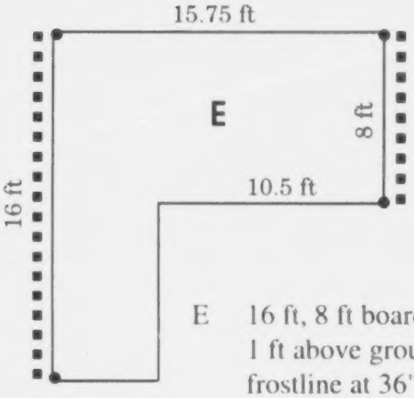
B 8 ft, 12 ft boards
2 ft above ground
frostline at 18"



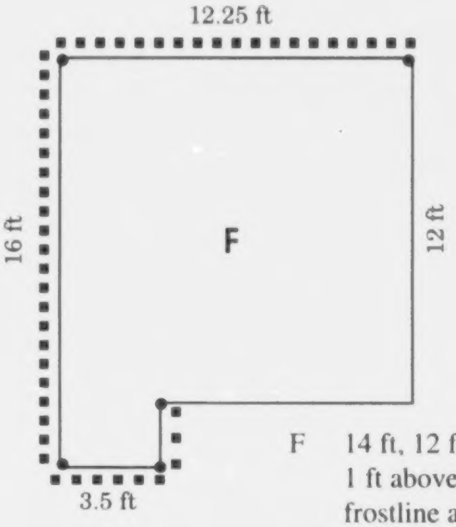
C 14 ft, 12 ft boards
3 ft above ground
frostline at 30"


15.75 ft
D
12 ft

D 16 ft, 12 ft boards
3 ft above ground
frostline at 3'


15.75 ft
E
8 ft
10.5 ft
16 ft

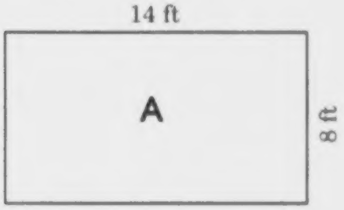
E 16 ft, 8 ft boards
1 ft above ground
frostline at 36"


12.25 ft
16 ft
F
12 ft
3.5 ft

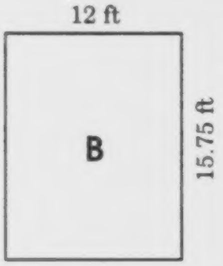
F 14 ft, 12 ft, 16 ft boards
1 ft above ground
frostline at 24"

Chapter 4, Practice Set 7

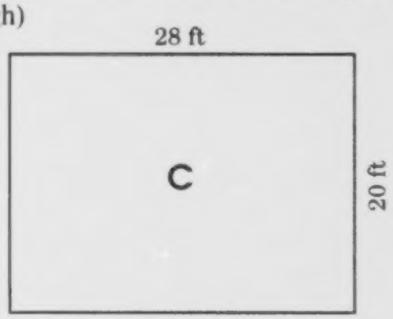
On a separate sheet of paper, make a list of the materials needed for each deck. Use the board lengths given for each example. (▪▪▪▪▪▪▪▪▪ indicates a railing 3' high)



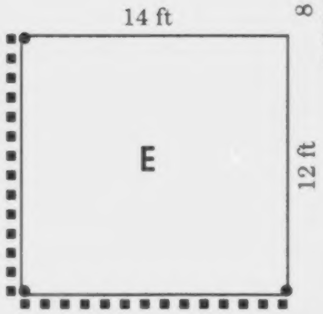
A 8', 14' boards
2 ft above ground
frostline at 18"


12 ft
B
15.75 ft

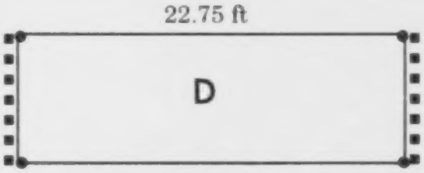
B 12', 16' boards
2 ft above ground
frostline at 2'



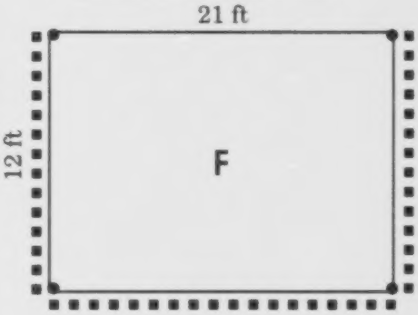
C 14', 16' boards
2 ft above ground
frostline at 36"



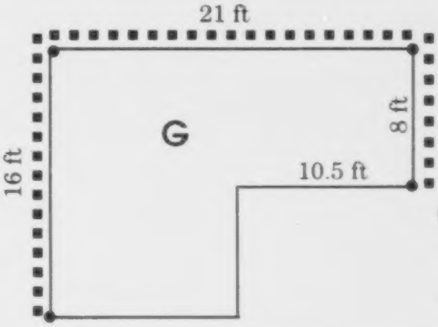
E 12, 14' boards
3 ft above ground
frostline at 24"


22.75 ft
8 ft
D

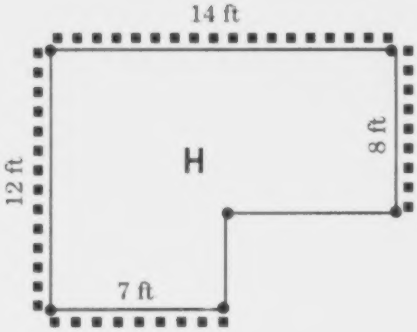
D 8' boards
3 ft above ground
frostline at 30"



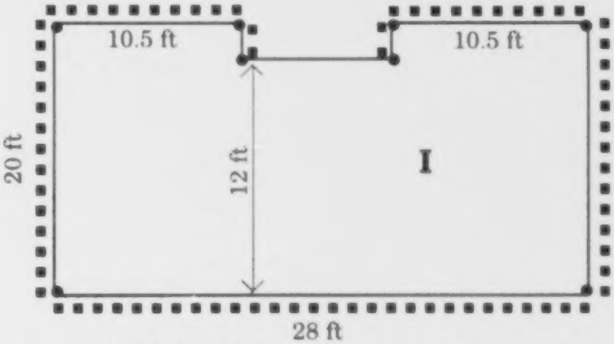
F 12' boards
3 ft above ground
frostline at 1.5'


21 ft
G
8 ft
10.5 ft
16 ft

G 8', 16' boards
1 ft above ground
frostline at 30"


14 ft
H
8 ft
12 ft
7 ft

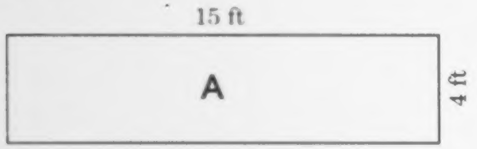
H 16', 12', 8' boards
1 ft above ground
frostline at 2'


10.5 ft
10.5 ft
20 ft
12 ft
I
28 ft

I 14', 12' boards
1 ft above ground
frostline at 18"

Chapter 4, Practice Set 8

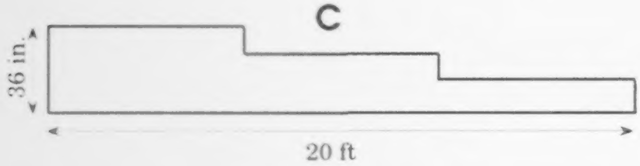
Find the number of wall stones and the amount of fill needed for each project. Use a separate sheet of paper.



A1. Use wedged units.
Dig the trench 6" deep by 8" wide.

A2. Use 4" by 18" units.
Dig the trench 6" deep by 8" wide.

A3. Use 4.5" by 8" units.
Dig the trench 6" deep by 8" wide.



C1. Use 4.5" by 8" units.
Dig the trench 6" deep by 15" wide.

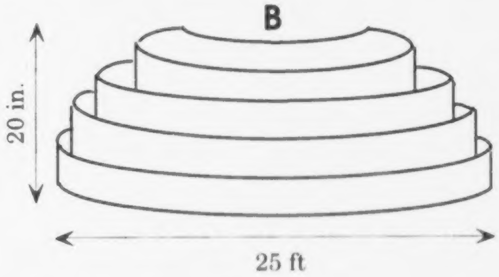
C2. Use 4" by 18" units.
Dig the trench 6" deep by 12" wide.

C3. Use wedged units.
Dig the trench 8" deep by 12" wide.

E1. Use wedged units.
Dig the trench 10" deep by 12" wide.

E2. Use 4" by 18" units.
Dig the trench 12" deep by 8" wide.

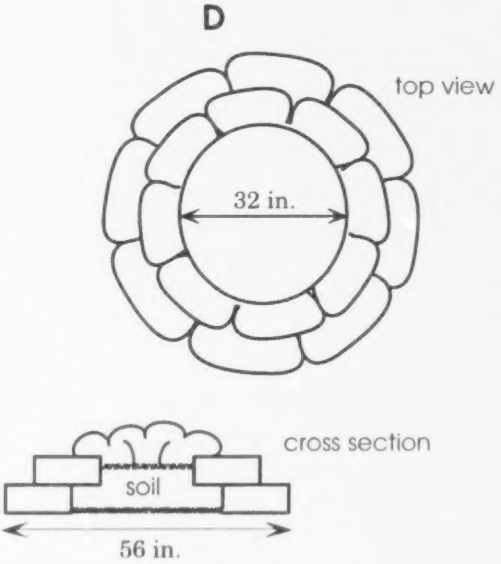
E3. Use 4.5" by 8" units.
Dig the trench 6" deep by 8" wide.



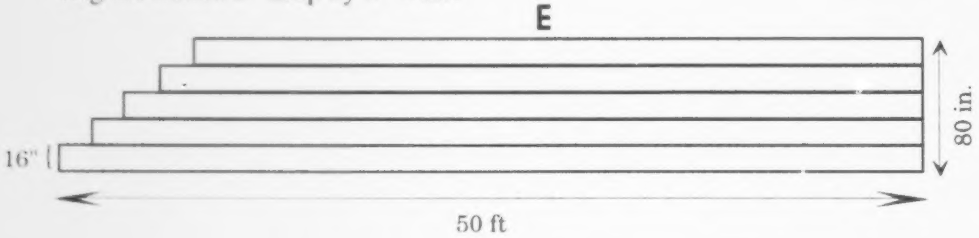
B1. Use 4" by 18" units.
Dig the trench 6" deep by 12" wide.

B2. Use 4.5" by 8" units.
Dig the trench 12" deep by 10" wide.

B3. Use wedged units.
Dig the trench 8" deep by 12" wide.

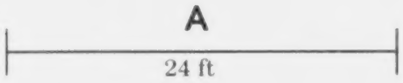


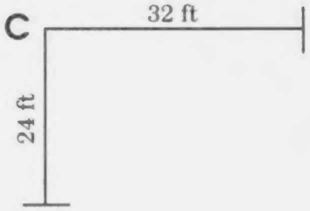
D1. Use wedged units (8" deep).
Dig the trench 6" deep by 10" wide.

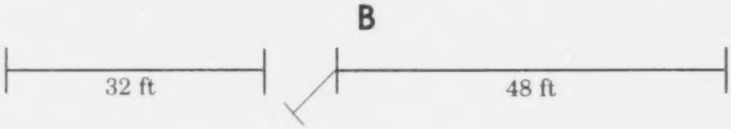


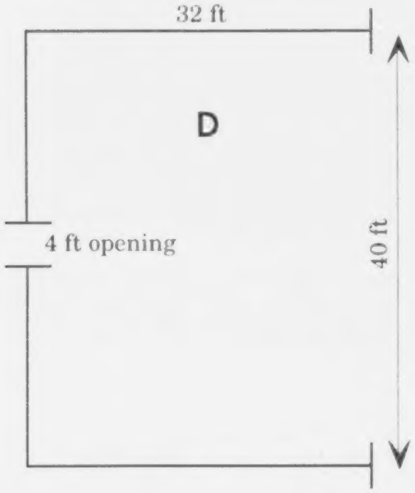
Chapter 4, Practice Set 9

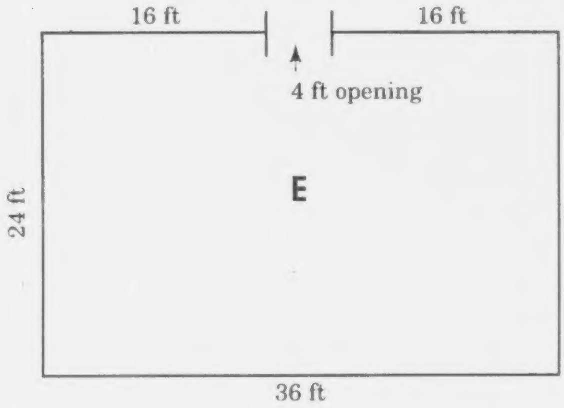
Find the number of **8' sections** of fence and the additional posts needed to construct each of these fences, **A-F**.

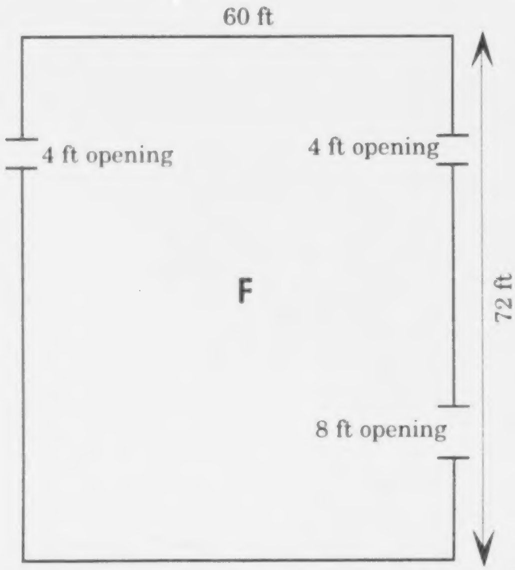







32 ft
D
4 ft opening
40 ft


16 ft
16 ft
4 ft opening
E
24 ft
36 ft

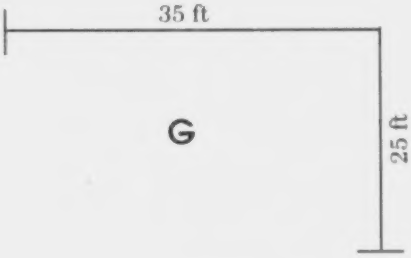

60 ft
4 ft opening
4 ft opening
F
72 ft
8 ft opening

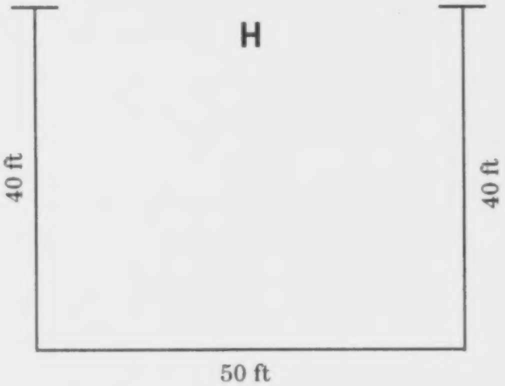
	8' sections	posts
A		
B		
C		
D		
E		
F		

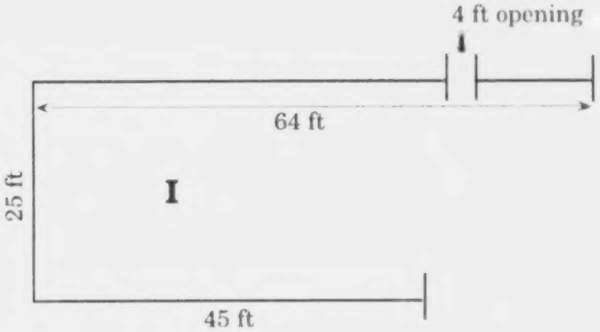
(continued)

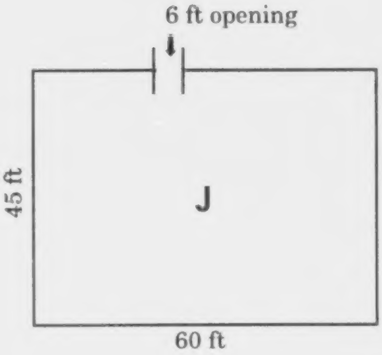
Chapter 4, Practice Set 9 *(page two)*

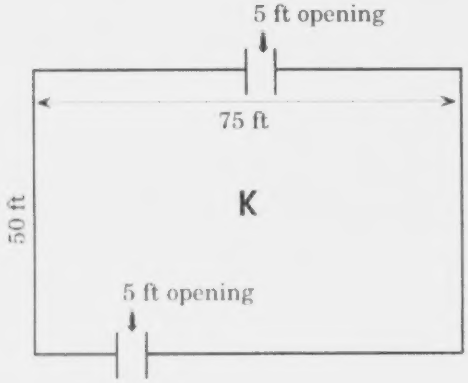
Find the number of **10' sections** of fence and the additional posts needed to construct each of these fences, **G-L.**

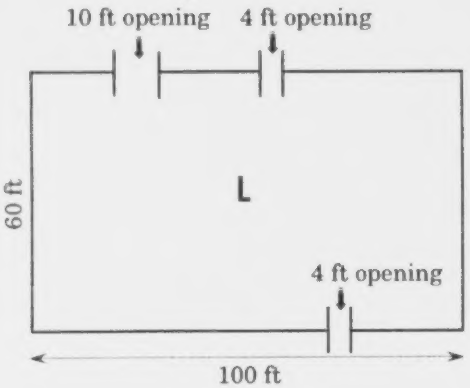



H
40 ft
40 ft
50 ft


4 ft opening
64 ft
25 ft
I
45 ft


6 ft opening
45 ft
J
60 ft


5 ft opening
75 ft
50 ft
K
5 ft opening


10 ft opening
4 ft opening
60 ft
L
4 ft opening
100 ft

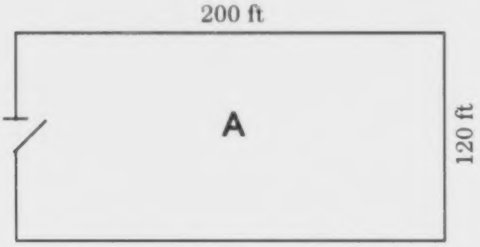
	10' sections	posts		10' sections	posts
G			J		
H			K		
I			L		

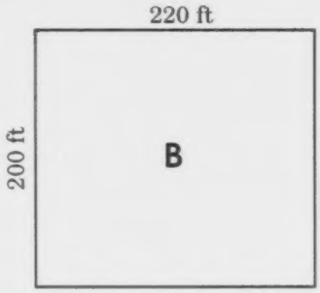
Chapter 4, Practice Set 10

Make the necessary calculations and fill in the blanks.

1. Give an estimate for the number of sections and additional posts needed for a fence along two sides of lot **A** (down one side and across the back). Use 8-foot sections and include one 4-foot sidewalk gate.

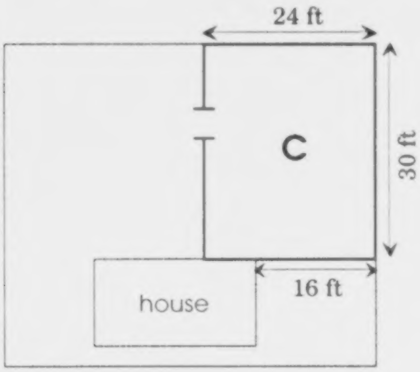
2. Find the number of 10-foot split rail sections of fence needed across the back and along one side of lot **B**. Find the number of additional posts needed also.

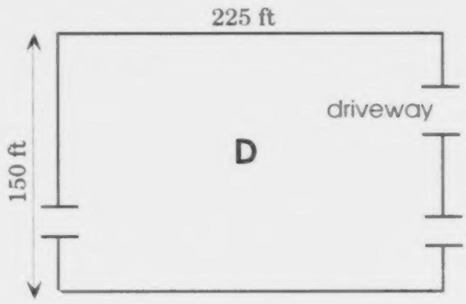




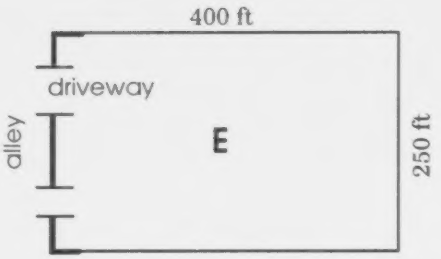
3. A customer has a service area (**C**) that needs "hiding." Using 8-foot sections of fence, find the number of sections and additional posts needed for the project. Place posts next to the house rather than attaching the fence to the house. Include one 4-foot gate.

4. Lot **D** is to be enclosed on all sides, using 10-foot sections of fence. Allow a 10-foot opening for the driveway and two 4-foot sidewalk openings, one in front and one in back. List the materials needed.





5. A homeowner wants a fence constucted on the alley side of lot **E**. A 10-foot driveway gate and a 4-foot sidewalk gate are needed. The fence should be extended 16 feet on each side to finish it off. Find the number of 8-foot sections and additional posts needed for the project.

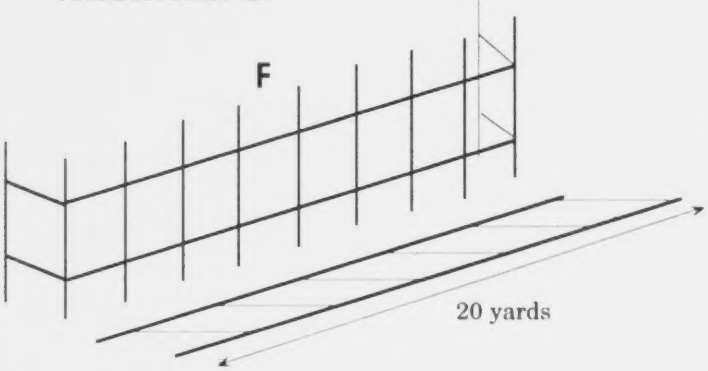


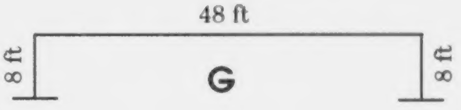
(continued)

Chapter 4, Practice Set 10 *(page two)*

6. The school board has approved installation of a split rail fence (**F**) along a sidewalk that goes straight down hill for 20 yards. A 10-foot end-section at both top and bottom is to be angled for both looks and extra support. How many 10-foot sections of fencing and how many posts are needed to build this fence?

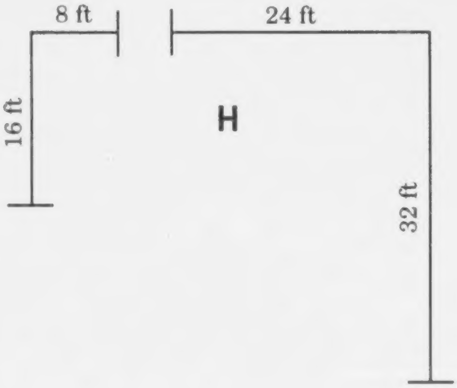
7. Find the number of 8-foot sections of fencing and additional posts needed to construct fence **G**.



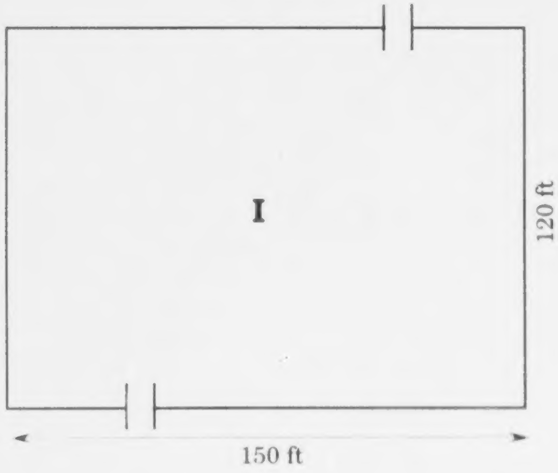


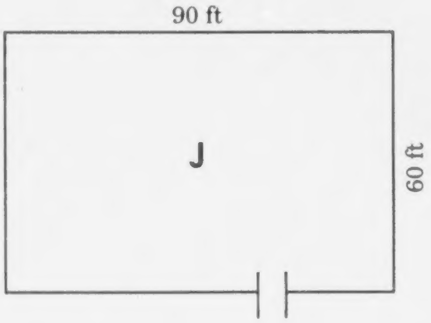
8. List the materials needed to build fence **H** with 8-foot sections.

9. Find how many 10-foot sections of fencing and additional posts are needed to build fence **I** with two 4-foot openings.



10. Fence **J** is to be built with 8-foot sections and one 4-foot opening. List the materials needed.





Chapter 4, Practice Set 11

Determine the materials needed for each of the projects shown on the next page and fill in the lettered spaces below.

1

Materials	Additional Information	Amount Needed
8' fencing		a ______
brick		b ______
mulch	4" deep, 2' wide	c ______

2

Materials	Additional Information	Amount Needed
rectangular pavers		a ______
mulch	3" deep, 2.5' wide	b ______

3

Materials	Additional Information	Amount Needed
wall stone	square units	a ______
patio block	14" square	b ______
fill	trench 2' x 1.5'	c ______

4

Materials	Additional Information	Amount Needed
8' ties		a ______ ties ______ deadmen
brick		b ______

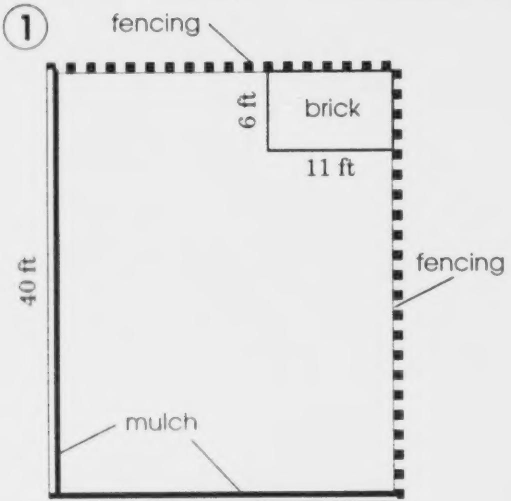
5

Materials	Additional Information	Amount Needed
wall stone	rectangular unit 2' high, trench 1' wide, 8" deep	a ______ stone
boards 8', 10', 12', 18'	deck 1' above ground frost line at 30"	b ______ posts c ______ collar boards
		d ______ joist boards total ______ 18' ______ 10'
		e ______ floor boards total ______ 12' ______ 8'
rectangular pavers		f ______ pavers

(continued)

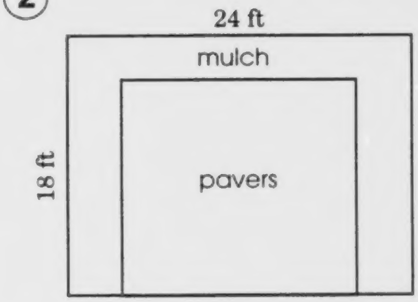
Chapter 4, Practice Set 11 *(page two)*

①



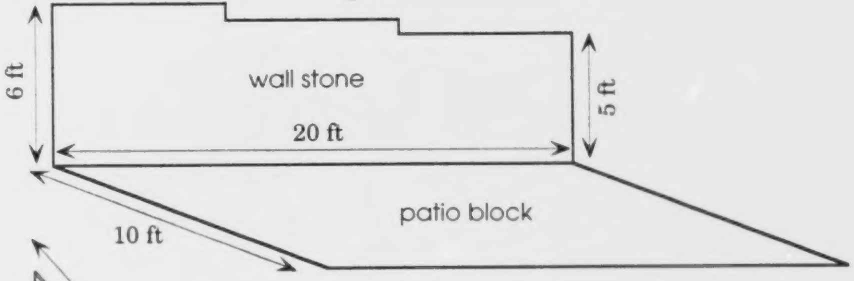
fencing
6 ft
brick
11 ft
fencing
40 ft
mulch
32 ft

②



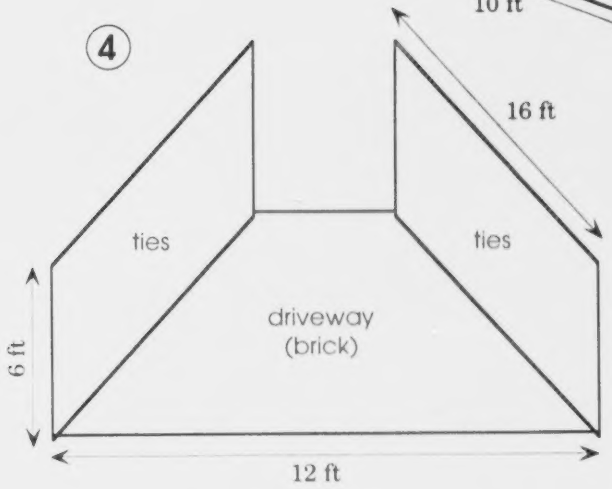
24 ft
mulch
18 ft
pavers

③



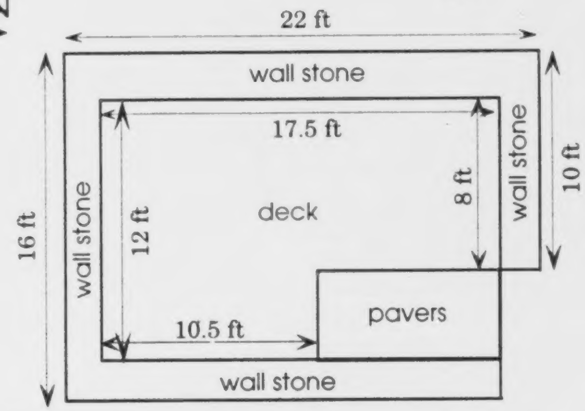
6 ft
wall stone
5 ft
20 ft
patio block
10 ft

④



16 ft
ties
ties
driveway
(brick)
6 ft
12 ft

⑤



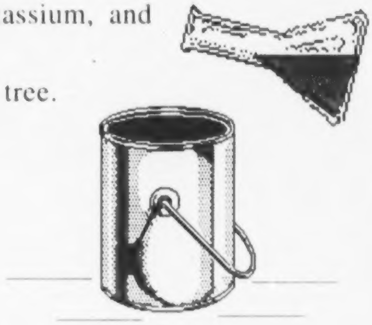
22 ft
wall stone
17.5 ft
wall stone
10 ft
8 ft
deck
16 ft
wall stone
12 ft
pavers
10.5 ft
wall stone

CHAPTER 5

GRASS SEED MIXTURES, SOD, FERTILIZERS, AND CHEMICALS

By the time you finish this chapter, you will be able to

1) determine how many pounds of grass seed will be needed to seed a new lawn or reseed an existing one.
2) determine the amounts of each kind of grass seed needed for a particular mixture.
3) calculate the cost of a particular mixture of grass seed.
4) determine how many yards of sod will be needed for a project.
5) calculate the amount of chemical needed to mix an insecticide, herbicide, or fertilizer.
6) calculate how many bags of fertilizer will be needed for a project.
7) calculate the amounts of nitrogen, phosphorus, potassium, and filler in a bag of fertilizer.
8) determine the amount of fertilizer needed to feed a tree.



* * * * * * * * * * * * * * *

Seed Broadcasting

A customer is sure to ask you some time,"How much grass seed do I need for my yard?" Before you can answer this question, you must know the size of the yard. Seed is broadcast (spread) over an area in pounds per square foot. Often the quote is given in **pounds per 1000 square feet**.

Examples in this book will use the following rates:

- **new lawns** - 5 lb of grass seed per 1000 sq ft
- **established lawns** - 4 lb of grass seed per 1000 sq ft

An established lawn is already growing; it simply needs to be improved.

Steps to finding the number of pounds of grass seed needed for a new or established lawn:

1. Calculate the area of the lawn.

2. Divide the area by 1000 square feet.

   units = area of lawn ÷ 1000 sq ft

3. For a new lawn, multiply by 5 pounds.

   pounds for new lawn = units x 5 lb

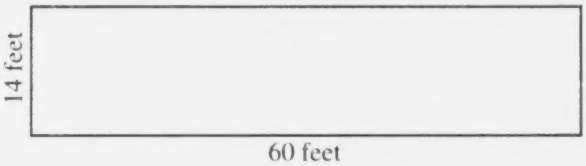
or For an established lawn, multiply by 4 pounds.

pounds for established lawn = units x 4 lb

Example 1

How many pounds of grass seed are needed to install the following new lawn? (Figure 5-1)

Figure 5-1

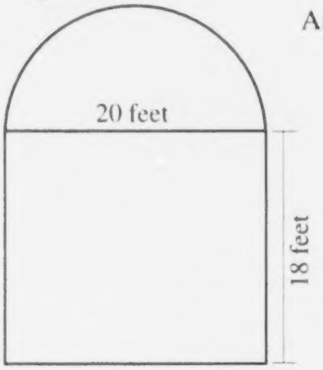


- area: 60' x 14' = 840 sq ft
- 840 sq ft ÷ 1000 sq ft = .84
- pounds needed for new lawn:
  .84 x 5 lb = 4.2 lb

Example 2

How many pounds of grass seed should be purchased to reseed this established lawn? (Figure 5-2)

Figure 5-2



Area of this lawn = area of rectangle + area of semicircle

- area = (20 ft x 18 ft) + (0.5 x 3.14 x 10 x 10)

  area = 360 sq ft + 157 sq ft = 517 sq ft
- 517 sq ft ÷ 1000 sq ft = .517
- pounds needed for the established lawn:

  .517 x 4 lb = 2.068 lb

In this manual, when dealing with fractions of pounds, we will round off figures to the nearest .5 pound. In example 2, then, the answer will be 2 pounds. Although seed is by no means inexpensive, supplying quotes of even amounts will not make much difference to the growth of the lawn. Calculations can be made with much less difficulty, and measuring seed will certainly be easier. When you start a job, be sure to ask your employer how to handle rounding of figures. The business you work for may use a different method from this one.

Example 3

Find the number of pounds of grass seed needed for this new lawn (Figure 5-3).

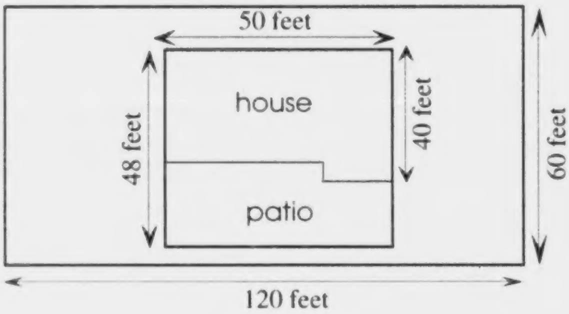
Area of this lawn = total area – (combined area of house + patio)

- area = (120 ft x 60 ft) – (50 ft x 48 ft)

  area = 7200 sq ft – 2400 sq ft = 4800 sq ft
- 4800 sq ft ÷ 1000 sq ft = 4.8
- pounds needed for the new lawn:

  4.8 x 5 lb = 24 lb

Figure 5-3



Seed Mixtures

Grass seed is sold in pre-measured packages and custom blended mixes. The seed is a mixture of various percentages of different grasses relative to the total weight. When custom blending, the seed varieties are packaged in bulk containers. The worker must calculate how many pounds or ounces of each variety will be needed for the desired total amount.

Steps to calculating the number of ounces of a particular seed contained in a grass seed mixture:

1. Convert the number of pounds desired to ounces.
2. Convert each percent in the mixture to its decimal equivalent.
3. Multiply each decimal equivalent by the total number of ounces in the mixture.
4. For answers greater than 16 ounces, divide by 16 to convert to pounds and ounces.

Note: The following examples of possible custom blended mixtures are in no way intended to be actual recommendations. Consult your horticulture instructor for recommendations of the proper mixes for sunny, shady, and other areas.

Example 1

The following mixture is listed on a 5-pound, pre-packaged grass seed mix.

19.2%	Kentucky Bluegrass
19.5%	Parade Kentucky Bluegrass
28.8%	Perennial Ryegrass
32%	Creeping Red Fescue
0.5%	inert matter

If you were asked to mix this particular combination, how much of each variety would you include?

1. First, convert pounds of seed to ounces of seed. This is especially important when dealing with amounts less than 10 pounds.

$$\frac{1\text{ lb}}{16\text{ oz}} = \frac{5\text{ lb}}{?}$$

$$\frac{16\text{ oz} \times 5\text{ lb}}{1\text{ lb}} = 80\text{ ounces}$$

2. Next, convert each percent to its decimal equivalent:

   19.2% = .192, 19.5% = .195, 28.8% = .288, 32% = .32 and .5% = .005.

3. Finally, multiply 80 ounces by each of the decimal equivalents to obtain the number of ounces of each species needed. Round answers to the tenths place for practical application.

   Kentucky Bluegrass .192 x 80 = 15.36 = 15.4 oz

   Parade Kentucky Bluegrass .195 x 80 = 15.6 oz

   Perennial Ryegrass .288 x 80 = 23.0 oz

   Creeping Red Fescue .32 x 80 = 25.6 oz

   Inert matter .005 x 80 = .4 oz

Example 2

A 10-pound box of pre-packaged grass seed contains:

25% Parade Kentucky Bluegrass
20% Creeping Red Fescue
30% Annual Ryegrass
15% Shadow Chewings Fescue
5% inert matter
5% weeds

How many pounds and ounces of each variety of grass seed are found in the box?

1. Change 10 pounds to ounces.
2. Change each percent to its decimal equivalent.
3. Multiply each decimal equivalent by the total ounces in the box.
4. Convert the answers to pounds by dividing by 16.

Variety	Decimal Equivalent	x	Ounces in Box	=	Ounces per Variety	÷	16	=	Pounds & Ounces
Parade Ky. Bluegrass	.25	x	160	=	40 oz	÷	16	=	2 lb 8 oz
Creeping Red Fescue	.20	x	160	=	32 oz	÷	16	=	2 lb
Annual Ryegrass	.30	x	160	=	48 oz	÷	16	=	3 lb
Shadow Chewings Fescue	.15	x	160	=	24 oz	÷	16	=	1 lb 8 oz
inert matter	.05	x	160	=	8 oz	÷	16	=	(8 oz)
weeds	.05	x	160	=	8 oz	÷	16	=	(8 oz)
	Total contents of box			=	160 oz (10 lb)			=	8 lb 32 oz (10 lb)

Note: Remember that total figures will not always be exact because the column figures are rounded off to tenths for practical applications.

Example 3

A 15-pound custom-blended mixture of grass seed is to contain the following percentages of grass seed:

23.5% Creeping Red Fescue
35.5% Annual Ryegrass
20.4% Adelphi Kentucky Bluegrass
15.6% Shadow Chewings Fescue
2% inert matter
3% weeds

How many pounds and ounces of each variety are needed?

1. Change 15 pounds to ounces.
2. Change each percent to its decimal equivalent.
3. Multiply each decimal equivalent by the total ounces in the box.
4. Convert the answers to pounds by dividing by 16.

Variety	Decimal Equivalent	x	Ounces in Box	=	Ounces per Variety	÷	16	=	Pounds & Ounces
Creeping Red Fescue	.235	x	240	=	56.4 oz	÷	16	=	3 lb 8 oz
Annual Ryegrass	.355	x	240	=	85.2 oz	÷	16	=	5 lb 5 oz
Adelphi Ky. Bluegrass	.204	x	240	=	49 oz	÷	16	=	3 lb 1 oz
Shad. Chewings Fescue	.156	x	240	=	37.4 oz	÷	16	=	2 lb 5 oz
inert matter	.02	x	240	=	4.8 oz	÷	16	=	(5 oz)
weeds	.03	x	240	=	7.2 oz	÷	16	=	(7 oz)
Total contents of box				=	240 oz (15 lb)			=	13 lb 31 oz (14 lb 15 oz)

Be sure to check total weights. All percentages must total 100%. Also, the sum of all the weights of the seed varieties must be equal to the total weight of the mixture (with rounding off taken into consideration).

Pricing Seed Mixtures

A worker who is assigned custom mixing of grass seed mixtures from bulk must be able to price the mixture. The number of ounces of each variety of seed used and the price per ounce of each variety determine the price of the entire mixture. Table 5-1 provides prices of some common grass seed varieties. Use the price for 1 pound for any amounts up to 9 pounds, the price for 10 pounds for lots of 10–19 pounds, and the price for 20 pounds for lots of 20 or more pounds.

Prices by Weight for Some Grass Seed Varieties Table 5-1

Variety	1 lb	10 lb	20 lb
Omega II Perennial Ryegrass	$2.10	$21.00	$29.40
Creeping Red Fescue	2.35	20.90	36.80
Chewings Fescue	2.60	23.40	41.60
Aurora Hard Fescue	4.20	38.20	68.80
Eclipse Kentucky Bluegrass	6.70	55.60	100.00
Ram I Kentucky Bluegrass	6.50	54.00	97.20
Pennlinks Creeping Bentgrass	13.60	119.70	215.40

Steps to calculating the price of a custom-blended grass seed mixture:

1. Find the number of ounces of each variety of seed in the mixture.
2. Find the price of one ounce of each variety of seed using Table 5-1. (Use the column that corresponds to the amount being mixed.)
3. Multiply the ounces of each variety by the price per ounce. Add these to find the total price.

Example 1

Find the price of the following 6-pound mixture.

38% Eclipse Kentucky Bluegrass
35% Omega II Perennial Ryegrass
25% Pennlinks Creeping Bentgrass
2% weeds

1. 6 lb mixture = 96 oz

Eclipse	.38 x 96 =	36.5 oz
Omega II	.35 x 96 =	33.6 oz
Pennlinks	.25 x 96 =	24.0 oz
weeds	.02 x 96 =	1.9 oz

2. 1 lb Eclipse Kentucky Bluegrass costs $6.70 ÷ 16 oz = $.42 per oz
1 lb Omega II Perennial Ryegrass costs $2.10 ÷16 oz = $.13 per oz
1 lb Pennlinks Creeping Bentgrass costs $13.60 ÷ 16 oz = $.85 per oz

(continued)

3.

Variety	Ounces in Mixture		Price per oz	Price for Variety
Eclipse	36.5	x	.42 =	$15.33
Omega II	33.6	x	.13 =	4.37
Pennlinks	24	x	.85 =	20.40
weeds	1.9	NC		
			total	$40.10

One last consideration: The customer wants to buy a full 6 pounds of seed. From the preceding calculations, you can see that nearly 2 ounces of the mixture is weed seed. You will need to compensate the customer for the weed seed by adding 2 ounces more of one of the grass varieties to the mixture. This "compensation" raises the total price of the seed a little. However, a customer who wants good lawn growth will not mind paying the few extra cents.

Variety	Ounces in Mixture			Price per oz
Eclipse	36.5 + 1.9 = 38.4	x	.42 =	$16.13
Omega II	33.6	x	.13 =	4.37
Pennlinks	24	x	.85 =	20.40
weeds	1.9 NC			
			total	$40.90

Sod Installation

Sod is the answer for projects that require an "instant" lawn. Sod is commercially grown grass that is cut and rolled much like carpeting. **Each roll covers 1 square yard or 9 square feet.** The dimensions of the rolls may be:

1 foot by 9 feet *or* **1.5 feet by 6 feet**

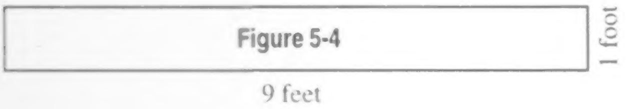


Figure 5-4

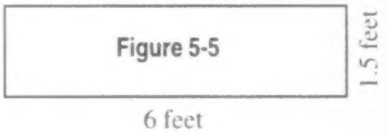


Figure 5-5

Steps to calculating the number of square yards of sod needed for a project:

1. Calculate the area to be covered in square feet.
2. Divide the area by 9 square feet.

Example 1

How many yards of sod are needed to cover a rectangular yard that measures 25 feet by 50 feet?

- area: 25 ft x 50 ft = 1250 sq ft
- yards of sod: 1250 sq ft ÷ 9 sq ft = 138.88 *or* 139

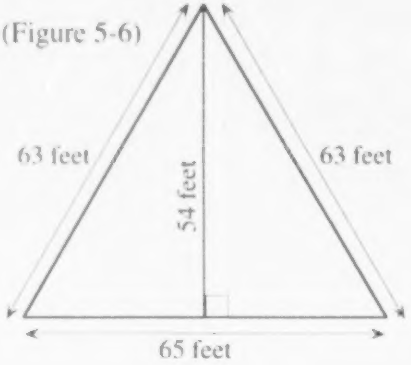
(*Note:* The answer is rounded because sod is sold only by the yard.)

Example 2

Find the number of yards of sod needed to cover this yard. (Figure 5-6)

- area for sod:
  (65 ft x 54 ft) ÷ 2 = 1755 sq ft
- yards of sod:
  1755 sq ft ÷ 9 sq ft = 195 yd

Figure 5-6

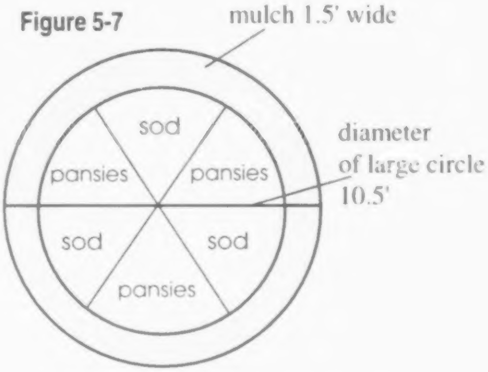


Example 3

In front of a new office building a landscape architect plans to install this circular ornamental garden. How many yards of sod are needed? How much mulch 3 inches deep is needed for the garden? (Figure 5-7)

- area for sod = area of small circle ÷ 2
  (because half of the circle - 3 out of 6 pie wedges- is composed of sod.)
  area for sod = (3.14 x 9 x 9) ÷ 2
  = 127.17 sq ft
- yards of sod: 127.17 sq ft ÷ 9 sq ft
  = 14.13 *or* 15
- area for mulch = area of large circle – area of small circle
  area for mulch = (3.14 x 10.5 x 10.5) – (3.14 x 9 x 9)
  346.185 sq ft – 254.34 sq ft = 91.845 sq ft
- cu yd of mulch = area of mulch x depth
  = 91.845 sq ft x $^{3}/_{12}$ ft = 22.96125 cu ft
  22.96 cu ft ÷ 27 cu ft = 0.9 cu yd of mulch

Figure 5-7



Mixing Chemicals

Chemicals are used throughout the horticulture industry for various purposes like fertilizing plants and controlling insect pests and weeds. The application rate for each chemical is stated clearly on the product label.

Example 1

The label on an insecticide states that 2 quarts of the product will treat an area of 1 acre (43,560 square feet). The label also states that water should be mixed with 2 quarts of insecticide to make a 10-gallon solution. The worker who is to mix the solution must determine how much water to use.

	chemical	2 quarts
+	water	? quarts
	total solution	10 gallons *or* 40 quarts

water = 40 quarts − 2 quarts = 38 quarts

The worker will need 2 quarts of insecticide mixed with 38 quarts of water to make a 10-gallon solution.

Example 2

How much water should be mixed with a herbicide that is applied 2 pints per acre of area to make a 6-gallon solution?

	chemical	2 pints
+	water	? pints
	total solution	6 gallons *or* 48 pints

water = 48 pints − 2 pints = 46 pints

You will need 2 pints of insecticide mixed with 46 pints of water to make a 6-gallon solution.

In certain situations the recommended application rate is too great or too small for the area that needs treatment. For example, the recommended application rate for a product may be 15 pounds per acre (43,560 square feet), but the area to be treated is only 5000 square feet. Mixing the recommended amount would be wasteful and expensive. Instead, using a "conversion factor," you can correctly mix smaller or greater amounts than the one recommended.

$$\text{conversion factor} = \frac{\text{area to be treated}}{\text{recommended coverage area}}$$

Once you know what the conversion factor is, multiply the recommended amount of chemical by that factor to determine the correct amount to be mixed for a smaller or larger area. In this example:

$$\text{conversion factor} = \frac{5000 \text{ sq ft}}{43{,}560 \text{ sq ft}} = .1148 \textit{ or } .11$$

15 pounds x .11 = 1.65 pounds of chemical needed

The answer is more meaningful if you convert the .65 pounds to ounces:

.65 lb x 16 oz = 10.4 *or* 10 oz *Therefore,*

1 pound 10 ounces of chemical is needed to treat 5000 square feet.

Some products are mixed with water and another chemical substance like diesel oil. The conversion factor is used to calculate any part of the chemical mixture, as the following example illustrates.

Example 3

A certain chemical product label states that the chemical should be applied 2 quarts per acre with 1 gallon of diesel oil and enough water to make a 5-gallon solution. (1 quart = 32 ounces) What amounts of water and diesel oil will be needed to treat a plot 150 feet by 200 feet?

For one acre

	chemical	2 quarts
+	diesel oil	1 gallon (or 4 quarts)
	water	?
	total solution	5 gallons *or* 20 quarts

20 quarts – (2 quarts + 4 quarts) = 14 quarts
amount of water needed: 14 quarts

For a plot 150' by 200'

A = 150 x 200 = 30,000 sq ft

$$\text{conversion factor} = \frac{30{,}000 \text{ sq ft}}{43{,}560 \text{ sq ft}} = \mathbf{.69}$$

chemical	2 qt x .69 =	1.38 qt *or* **1 qt 12 oz** (.38 qt x 32 oz = 12.16 *or* 12 oz)
diesel oil	4 qt x .69 =	2.76 qt *or* **2 qt 24 oz** (.76 qt x 32 oz = 24.32 *or* 24 oz)
water	14 qt x .69 =	9.66 qt *or* **9 qt 21 oz** (.66 qt x 32 oz = 21.12 *or* 21 oz)
total solution	=	**12 qt 57 oz** *or* **13 qt 25 oz**

As a final check, multiply the amount of the total solution for an acre by the conversion factor. This amount should be very close to the sum of the amounts calculated for mixing. The amounts will not be exactly equal because of the rounding that is done in the calculations.

Check: 20 qt x .69 = 13.8 qt *or* **13 qt 26 oz**

Some chemical product labels have tables similar to those in Table 5-2. These eliminate the need for calculations. Other products come with tables that tell the amount of chemical to mix with a given number of gallons of water to obtain a desired percentage of chemical in the solution. Tables 5-3 to 5-5 give equivalents that are helpful in making these conversions.

Table 5-2 SAMPLES

Do-em-in Liquid Mixing Instructions

Amount of Product	Amount of Water
5 tablespoons	1 gallon
2 cups	6 gallons
1 quart	12 gallons

So-long Weeds Liquid Mixing Instructions

Amount of Product	Amount of Water	Coverage
1 quart	1 gallon + 1 pint	75 sq ft
2 quarts	2 ¼ gallons	150 sq ft
1 gallon	4 ½ gallons	300 sq ft

For example, Table 5-3, Column 2, shows that 1 part chemical added to 25 parts water yields a 4% solution. As an equivalent, adding ⅓ pint of chemical to 1 gallon of water results in a 4% solution.

Table 5-3 **Equivalent Quantities for Liquid Insecticides in Water**

Water	1 to 25 (4%)	1 to 50 (2%)	1 to 100 (1%)	1 to 200 (½%)	1 to 400 (¼%)	1 to 800 (⅛%)
1 gallon	5.12 oz (⅓ pt)	2.56 oz (5 ¼ T)	1.28 oz (3 T)	0.64 oz (4 t)	0.32 oz (2 t)	0.16 oz (1 t)
3 gallons	15.56 oz (1 pt)	7.8 oz (½ pt)	3.84 oz (¼ pt)	1.92 oz (4 T)	0.96 oz (6 t)	0.48 oz (3 t)
5 gallons	25.6 oz (1 ⅔ pt)	12.8 oz (1 ½ c)	6.4 oz (¾ c)	3.2 oz (6 ½ T)	1.6 oz (3 ½ T)	0.8 oz (5 t)
100 gallons	(4 gal)	(2 gal)	(1 gal)	(2 qt)	(1 qt)	(1 pt)

T = 1 level tablespoon
t = 1 level teaspoon

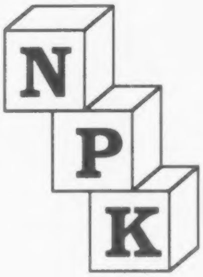
Chart of Conversions for Dry Insecticides **Table 5-4**

For 100 gallons of water	For 50 gallons of water	For 25 gallons of water	For 6 ¼ gallons of water	For 3 ⅛ gallons of water
1 pound	8 ounces	4 ounces	1 ounce	1 T
2 pounds	1 pound	8 ounces	2 ounces	2 T
4 pounds	2 pounds	1 pound	4 ounces	4 T

Chart of Conversions for Liquid Insecticides **Table 5-5**

For 100 gallons of water	For 50 gallons of water	For 25 gallons of water	For 6 ¼ gallons of water	For 3 ⅛ gallons of water
½ pint	¼ pint (4 fl oz)	4 T (2 fl oz)	1 T (½ fl oz)	½ T (¼ fl oz)
1 pint	½ pint (8 fl oz)	¼ pint (4 fl oz)	2 T (1 fl oz)	1 T (½ fl oz)
1 quart	1 pint (16 fl oz)	½ pint (8 fl oz)	4 T (2 fl oz)	2 T (1 fl oz)

Fertilizers



Fertilizers are used to provide living plants with nutrients that are absent from or available only in limited amounts in the growing medium. All fertilizers are labeled with a three-number formula like 10-6-4. These numbers represent percentages of a 100% total. They always refer to the same three chemicals in this order - nitrogen, phosphorus, and potassium.

Example 1

In the 10-6-4 formula, the first number indicates that 10% of the mixture is nitrogen; the second number indicates that 6% of the mixture is phosphorus; and the third number indicates that 4% of the mixture is potassium. In a 100-pound bag of 10-6-4 fertilizer,

10% of 100 lb is nitrogen: .10 x 100 lb = 10 lb
6% of 100 lb is phosphorus: .06 x 100 lb = 6 lb
4% of 100 lb is potassium: .04 x 100 lb = 4 lb

total chemicals present = 20 lb

The remaining weight in the bag (80 pounds) comes from a filler such as sand, clay, or vermiculite.

Example 2

How many pounds of nitrogen are contained in a 50-pound bag of a 20-16-16 fertilizer? We know that 20% of the 50 pounds is nitrogen.

.20 x 50 lb = 10 lb of nitrogen

Example 3

In a 25-pound bag of the 10-6-4 fertilizer in Example 1, how many pounds of filler are there?

100% – (10% + 6% + 4%) = 80% filler

pounds of filler = .80 x 25 lb = 20 lb

Example 4

How many pounds of potassium are there in a 50-pound bag of 30-16-12 fertilizer? We know that 12% of the contents is potassium.

.12 x 50 lb = 6 lb   There are 6 pounds of potassium.

Many commercial fertilizers are sold in 25-pound or 50-pound bags. Each bag is labeled with directions detailing application rates. For example, the label on a certain 25-pound bag of fertilizer might state that the bag will cover 1500 square feet of area. Before you buy that fertilizer, you should calculate how many bags you will need.

Steps to finding how many bags of fertilizer will be needed for a project:

1. Calculate the area to be treated.
2. Divide that figure (of area) by the area of coverage of **one** bag.

Example 5

A 50-pound bag of Green-glo fertilizer is labeled as covering 2000 square feet of area. How many bags are needed to fertilize the lawn in Figure 5-8?

- Area of lawn: 165 ft x 90 ft = 14,850 sq ft
- Number of bags needed:
  14850 sq ft ÷ 2000 sq ft = 7.425 or 8 bags

  You will need 8 bags, as you can not buy part of a bag.

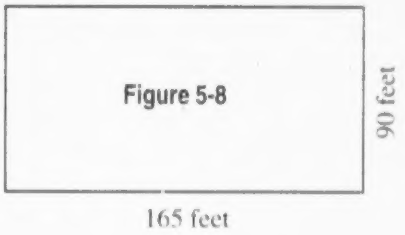


Figure 5-8

Example 6

How many 25-pound bags of fertilizer would you need to fertilize this lawn if each bag covers 1500 square feet? (Figure 5-9)

- Area = $\overset{A}{(90' \times 95')} + \overset{B}{(200' \times 25')}$

  8550 sq ft + 5000 sq ft =
  13,550 sq ft
- Number of bags needed:
  13,550 sq ft total ÷ 1500 sq ft per bag =
  9.03 or 10 bags

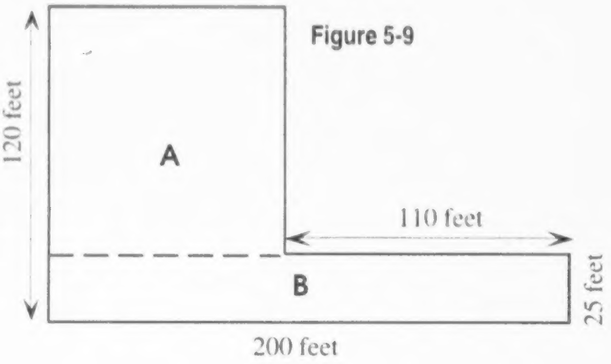


Figure 5-9

"Feeding" Trees

Arboriculture is a branch of the horticulture industry that deals with planting and care of trees. Part of the care involves fertilizing or "feeding" trees on a regular basis. Trees can be fed either liquid or dry fertilizer. Only dry fertilizer will be used in the examples discussed in this section.

How much fertilizer will you need to feed a deciduous tree? There are several methods used to determine this.

DBH Method

One method is based on **dbh** - the diameter of the tree at breast height. With this method, holes are drilled around the base of the tree under the surface of the soil. Fertilizer is then applied to each of the drilled holes.

Table 5-6 gives you an example using the **dbh** method. You can see how many pounds of 10-6-4 fertilizer will be needed for trees of different diameters. (Note that this is only one example; other fertilizer mixtures can also be used.)

Table 5-6 **Tree Size Related to Amount of Fertilizer Recommended**
(based on fertilizer percentages of 10-6-4)

Tree Size	Amount of Fertilizer
1" - 3" diameter	3 lb fertilizer mix per 1" trunk diameter
4" - 10" diameter	amount of fertilizer equal to the square of the trunk diameter (d^2)
over 10" diameter	10 lb fertilizer mix per 1" trunk diameter

In Table 5-6 locate the following examples:

- A 2-inch-diameter tree would receive 2 x 3 lb or 6 lb of total fertilizer mix.
- A 3-inch-diameter tree would receive 3 x 3 lb or 9 lb of total fertilizer mix.
- A 4-inch-diameter tree would receive 4 x 4 lb or 16 lb of total fertilizer mix.
- A 15-inch-diameter tree would receive 15 x 10 lb or 150 lb of total fertilizer mix.

Broadcasting Method

A second method of determining the fertilizer needs of a tree involves "broadcasting" fertilizer on the surface of the ground around the tree. This method is based on the total square footage of the tree canopy. Tree canopy is estimated by measuring the area on the ground that would be shaded by the leaves of the tree if the sun were directly above the tree. For the examples used in this section, 2 pounds of nitrogen will be applied for every 1,000 square feet of canopy.

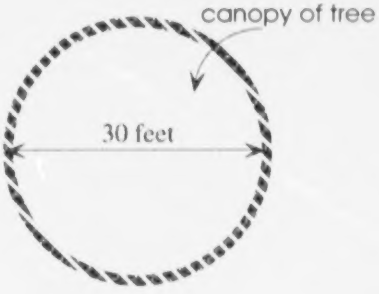
Steps to finding how much fertilizer will be needed to feed a tree using the broadcasting method:

1. Find the area of the canopy of the tree.
2. Divide the area of canopy by 1,000 square feet.
3. Multiply that figure by 2 pounds.
4. Pounds of fertilizer = pounds of nitrogen ÷ % of nitrogen from fertilizer formula

Example 7

A tree that needs to be fertilized has a canopy with a 30-foot diameter. How much 10-6-4 fertilizer should be broadcast around the base? (Assume the canopy is circular.) (Figure 5-10)

Figure 5-10

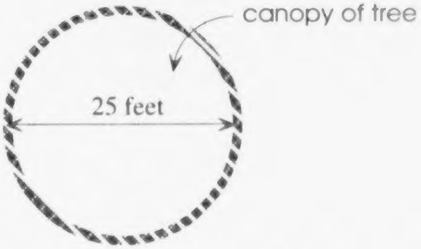


- area of canopy =
  3.14 x radius x radius
  3.14 x 15 x 15 = 706.5 sq ft
- 706.5 sq ft ÷ 1,000 sq ft = .7065
- pounds of nitrogen = .7065 x 2 lb =
  1.413 lb
- pounds of fertilizer = 1.413 lb ÷ 10%
  1.413 ÷ .10 = 14.13 lb *or*
  14 lb (to the nearest .5 lb)

Example 8

Another tree with a canopy 25 feet in diameter needs to be fertilized. How much 20-18-16 fertilizer should be broadcast around the base? (Figure 5-11)

Figure 5-11

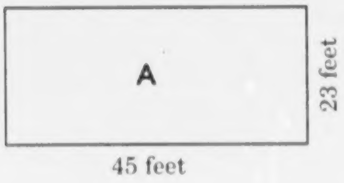


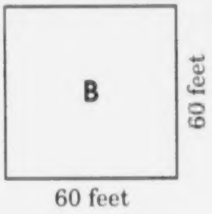
- area of canopy = 3.14 x radius x radius
  = 3.14 x 12.5 x 12.5
  area of canopy = 490.625 sq ft
- 490.625 sq ft ÷ 1,000 sq ft = .490625
- pounds of nitrogen = .490625 x 2 lb
  = .98125 lb
- pounds of fertilizer = .98125 lb ÷ 20%
  .98125 lb ÷ .20 = 4.90625 or 4.9
  pounds of fertilizer = **5 lb** (to the nearest .5 lb)

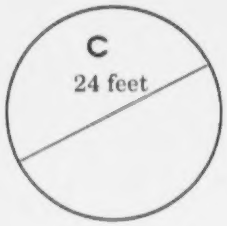
Chapter 5, Practice Set 1

Calculate how many pounds of seed are needed for each of these areas if you are installing the following:

A NEW LAWN **(A, B, C)**


A
23 feet
45 feet


B
60 feet
60 feet

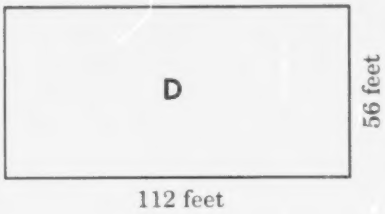


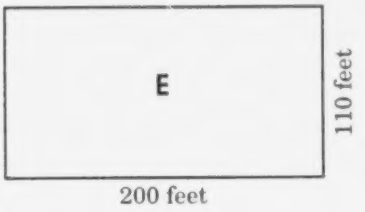
A ______________

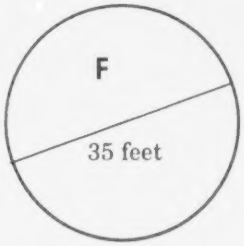
B ______________

C ______________

AN ESTABLISHED LAWN **(D, E, F)**


D
56 feet
112 feet


E
110 feet
200 feet

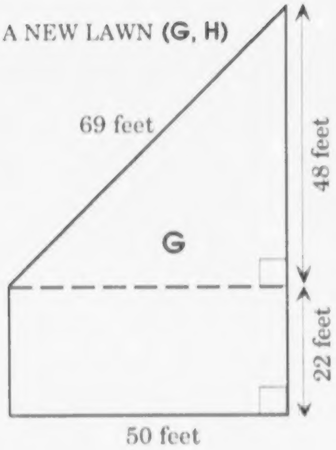


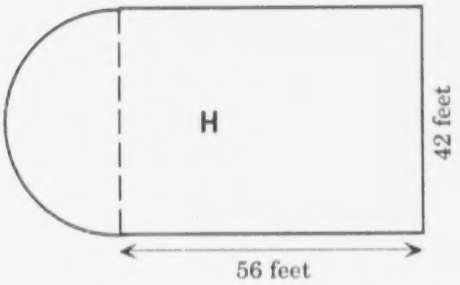
D ______________

E ______________

F ______________

A NEW LAWN **(G, H)**


69 feet
48 feet
G
22 feet
50 feet

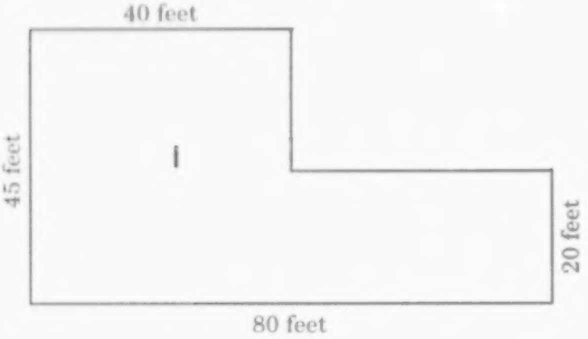

H
42 feet
56 feet

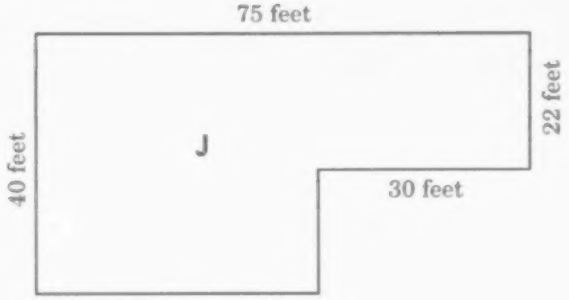
G ______________

H ______________

(continued)

AN ESTABLISHED LAWN **(I, J)**

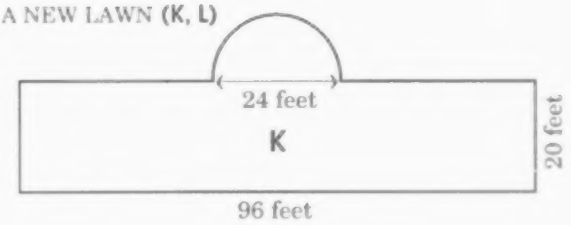

40 feet
45 feet
I
20 feet
80 feet

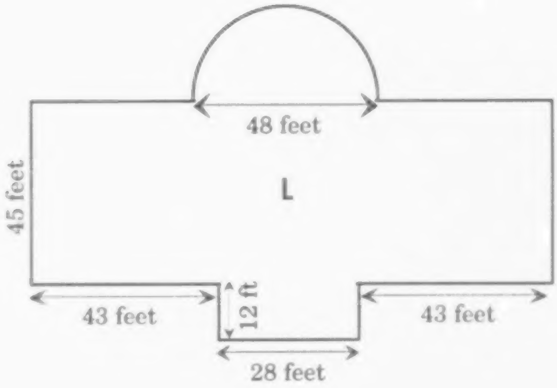

75 feet
22 feet
40 feet
J
30 feet

I ______________

J ______________

A NEW LAWN **(K, L)**


24 feet
K
20 feet
96 feet


48 feet
45 feet
L
43 feet
12 ft
43 feet
28 feet

K ______________

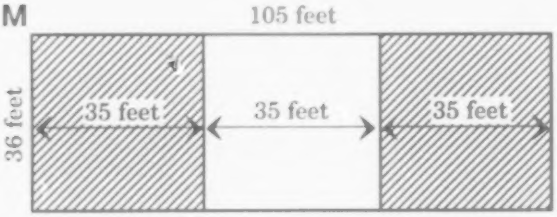
L ______________

M ______________

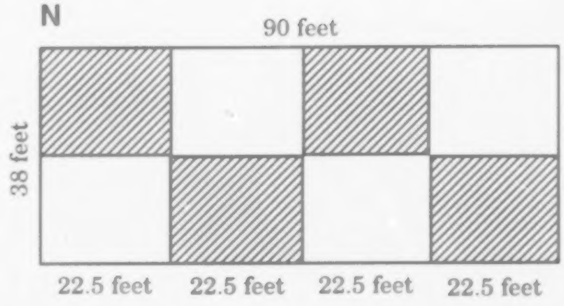
N ______________

AN ESTABLISHED LAWN (shaded sections only) **(M, N)**

M


105 feet
36 feet
35 feet
35 feet
35 feet

N

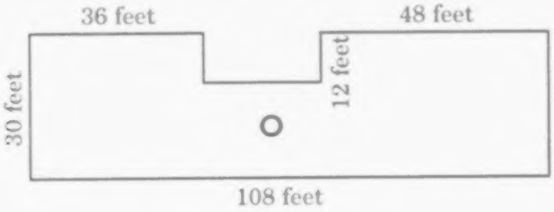

90 feet
38 feet
22.5 feet
22.5 feet
22.5 feet
22.5 feet

(continued)

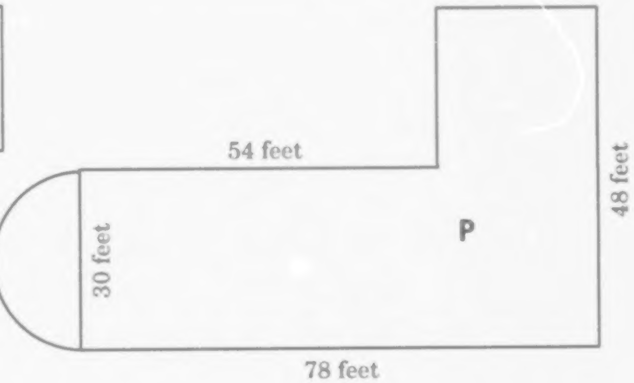
Calculate how many pounds of seed are needed for each of these areas if you are installing the following:

(continued)

A NEW LAWN **(O, P)**



36 feet
48 feet
30 feet
12 feet
O
108 feet

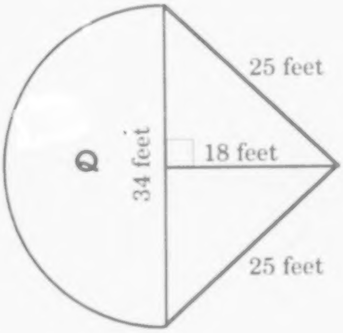


54 feet
48 feet
30 feet
P
78 feet

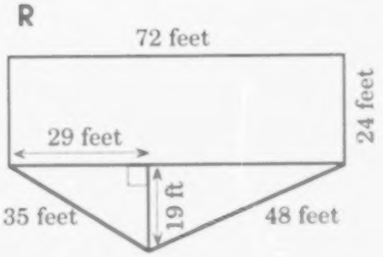
O ______________

P ______________

AN ESTABLISHED LAWN **(Q, R)**



Q
34 feet
18 feet
25 feet
25 feet



R
72 feet
24 feet
29 feet
35 feet
19 ft
48 feet

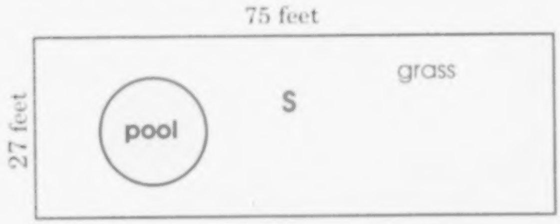
Q ______________

R ______________

S ______________

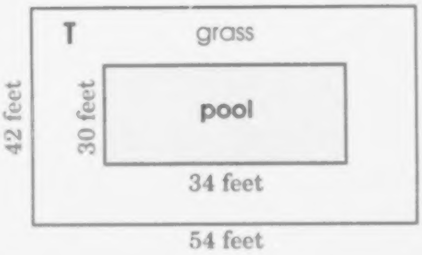
T ______________

A NEW LAWN **(S, T)**



75 feet
grass
S
27 feet
pool

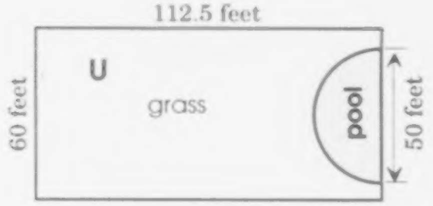
diameter of pool = 15 feet

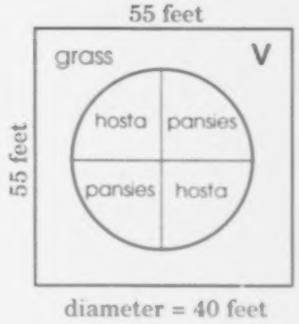


T
grass
42 feet
30 feet
pool
34 feet
54 feet

(continued)

AN ESTABLISHED LAWN **(U, V)**


112.5 feet
U
grass
pool
60 feet
50 feet


55 feet
grass
V
hosta
pansies
pansies
hosta
55 feet
diameter = 40 feet

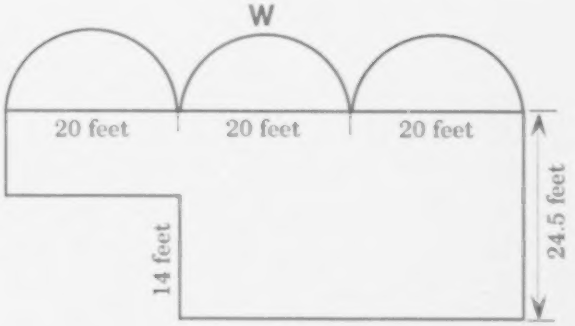
U ____________

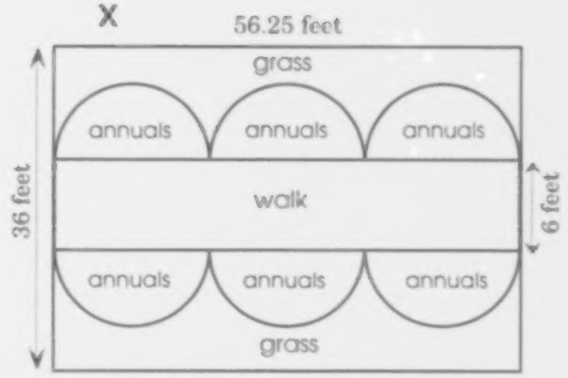
V ____________

W ____________

X ____________

A NEW LAWN **(W, X)**


W
20 feet
20 feet
20 feet
24.5 feet
14 feet


X
56.25 feet
grass
annuals
annuals
annuals
walk
annuals
annuals
annuals
grass
36 feet
6 feet

All annual beds are same size

Chapter 5, Practice Set 2

Using the following percentages, find how many ounces or pounds of each grass seed species will be needed to make up each mix. Also indicate how many ounces of crop seed, inert matter, and weeds are present. (Keep in mind that the totals will not always be exact, because column figures are rounded off to the tenths place for practical purposes.)

1	2 pounds	3 pounds	10 pounds
22% A-34 Kentucky Bluegrass			
19% Parade Kentucky Bluegrass			
19% Eclipse Kentucky Bluegrass			
11% Ram I Kentucky Bluegrass			
6% Adelphi Kentucky Bluegrass			
18% Pennfine Perennial Ryegrass			
2% crop seed			
2% inert matter			
1% weeds			

2	1.5 pounds	5 pounds	10 pounds
28% Creeping Red Fescue			
17% Baron Kentucky Bluegrass			
11% Shadow Chewings Fescue			
10% A-34 Kentucky Bluegrass			
6% Aurora Hard Fescue			
14% Omega II Perennial Ryegrass			
10% Annual Ryegrass			
1% crop seed			
2% inert matter			
1% weeds			

3	10 pounds	20 pounds	50 pounds
30% Creeping Red Fescue			
18% Chewings Fescue			
17% Shadow Chewings Fescue			
11% Nustar Kentucky Bluegrass			
10% Glade Kentucky Bluegrass			
9% Aurora Hard Fescue			
1% crop seed			
3% inert matter			
1% weeds			

(continued)

Chapter 5, Practice Set 2 *(page two)*

4	5 pounds	25 pounds	40 pounds
33% Creeping Red Fescue			
15% Baron Kentucky Bluegrass			
14% Parade Kentucky Bluegrass			
13% Prelude II Perennial Ryegrass			
12% Pennfine Perennial Ryegrass			
9.5% Omega II Perennial Ryegrass			
1% crop seed			
2% inert matter			
0.5% weeds			

5	3 pounds	10 pounds	25 pounds
40% Annual Ryegrass			
18% Chewings Fescue			
17% Creeping Red Fescue			
19% A-34 Kentucky Bluegrass			
6% inert matter			

6	10 pounds	20 pounds	45 pounds
23% Annual Ryegrass			
7% Creeping Red Fescue			
5% Aurora Hard Fescue			
34% A-34 Kentucky Bluegrass			
24% Ram I Kentucky Bluegrass			
7% inert matter			

7	15 pounds	35 pounds	60 pounds
35% Creeping Red Fescue			
25% Annual Ryegrass			
10% Pennfine Perennial Ryegrass			
20% Omega II Perennial Ryegrass			
5% Aurora Hard Fescue			
2% inert matter			
3% weeds			

8	18 pounds	32 pounds	45 pounds
38% A-34 Kentucky Bluegrass			
29% Parade Kentucky Bluegrass			
23% Prelude II Perennial Ryegrass			
8% Creeping Red Fescue			
2% weeds			

Chapter 5, Practice Set 3

Give a **price quotation** for the number of pounds as shown for each seed mixture after referring to the price list in the box. Add inert matter to Creeping Red Fescue when making your calculations.

PRICES BY WEIGHT FOR SOME GRASS SEED VARIETIES

Variety	1 lb	10 lb	20 lb
Omega II Perennial Ryegrass	$2.10	$21.00	$29.40
Creeping Red Fescue	2.35	20.90	36.80
Chewings Fescue	2.60	23.40	41.60
Aurora Hard Fescue	4.20	38.20	68.80
Eclipse Kentucky Bluegrass	6.70	55.60	100.00
Ram I Kentucky Bluegrass	6.50	54.00	97.20
Pennlinks Creeping Bentgrass	13.60	119.70	215.40

1

	3 pounds	15 pounds	25 pounds	45 pounds
23% Omega II Perennial Ryegrass				
9% Creeping Red Fescue				
5% Aurora Hard Fescue				
34% Eclipse Kentucky Bluegrass				
24% Ram I Kentucky Bluegrass				
5% inert matter				
TOTAL PRICE				

2

	6 pounds	12 pounds	18 pounds	30 pounds
40% Omega II Perennial Ryegrass				
18% Chewings Fescue				
15% Creeping Red Fescue				
20% Eclipse Kentucky Bluegrass				
7% inert matter				
TOTAL PRICE				

3

	12 pounds	20 pounds	35 pounds
32% Omega II Perennial Ryegrass			
18% Chewings Fescue			
15% Aurora Hard Fescue			
14% Creeping Red Fescue			
15% Ram I Kentucky Bluegrass			
6 % inert matter			
TOTAL PRICE			

(continued)

Chapter 5, Practice Set 3 *(page two)*

4

	4 pounds	8 pounds	12 pounds	22 pounds
60% Omega II Perennial Ryegrass				
12% Chewings Fescue				
12% Creeping Red Fescue				
11% Eclipse Kentucky Bluegrass				
5% inert matter				
TOTAL PRICE				

5

	5 pounds	13 pounds	17 pounds	24 pounds
40% Ram I Kentucky Bluegrass				
20% Eclipse Kentucky Bluegrass				
15% Chewings Fescue				
12% Creeping Red Fescue				
8% Omega II Perennial Ryegrass				
5% weeds				
TOTAL PRICE				

6

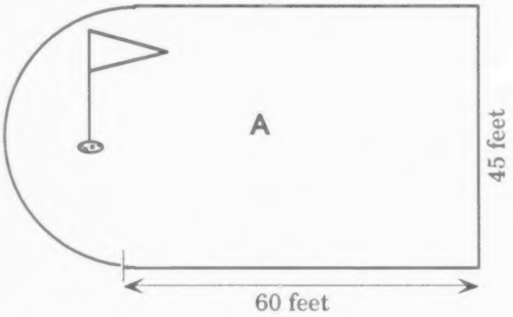
	8 pounds	15 pounds	28 pounds	40 pounds
40% Omega II Perennial Ryegrass				
18% Chewings Fescue				
18% Creeping Red Fescue				
17% Eclipse Kentucky Bluegrass				
7% inert matter				
TOTAL PRICE				

Chapter 5, Practice Set 4

Answer the following questions and fill in the blanks.

1. A rectangular area measures 150 feet by 25 feet. How many yards of sod would be needed to make it into a lawn? ____________

2. How many yards of sod are needed for golf green **A**?



A ____________

3. A customer who is building a new home wants sod installed on all the lawn areas. These areas to be covered measure 60 feet by 50 feet; 40 feet by 50 feet; and 150 feet by 7 feet. How many yards of sod are needed for this job? ____________

4. A customer's lawn has grown so weedy that the entire lawn must be tilled and resodded. The areas that need to be resodded measure 10 feet by 16 feet; 4 feet by 5 feet; and 15 feet by 7 feet. How many yards of sod will be needed? ____________

5. All the tree lawns on both sides of Second Street were torn up when the new water line was laid. The city has contracted with your landscape firm to sod these areas. There are 5 city blocks involved, each 750 feet long. The sod will be 3 feet wide. How many yards of sod will you need for both sides of the street? ____________

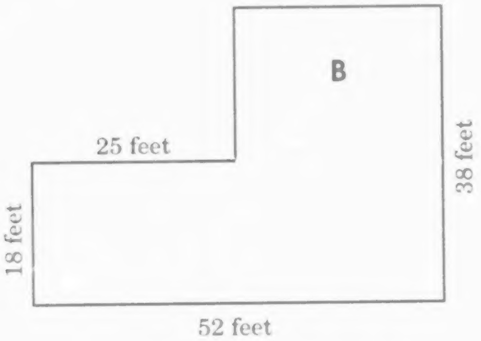
6. Your neighbors have decided to quit vegetable gardening. They want the garden area covered with sod. Their rectangular garden measures 12 feet by 11 feet. How many yards of sod will they need? ____________

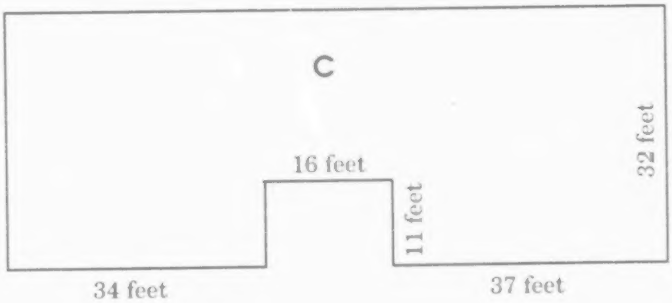
(continued)

Chapter 5, Practice Set 4 *(page two)*

7. Find the number of yards of sod needed for project B. **B** ____________

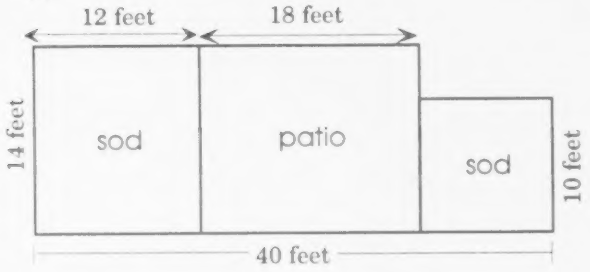
8. Find the number of yards of sod needed for project C. **C** ____________


B
25 feet
38 feet
18 feet
52 feet

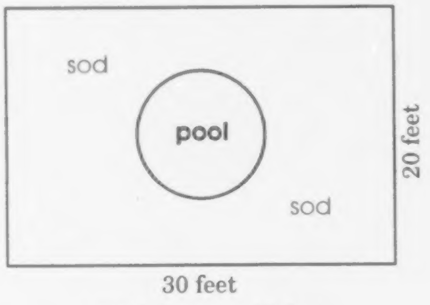

C
16 feet
32 feet
11 feet
34 feet
37 feet

Find how many yards of sod are needed for projects **A** through **E** and fill in the blanks below.

A

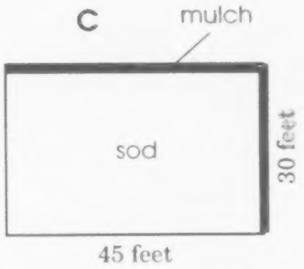

12 feet
18 feet
14 feet
sod
patio
sod
10 feet
40 feet

B


sod
pool
sod
20 feet
30 feet

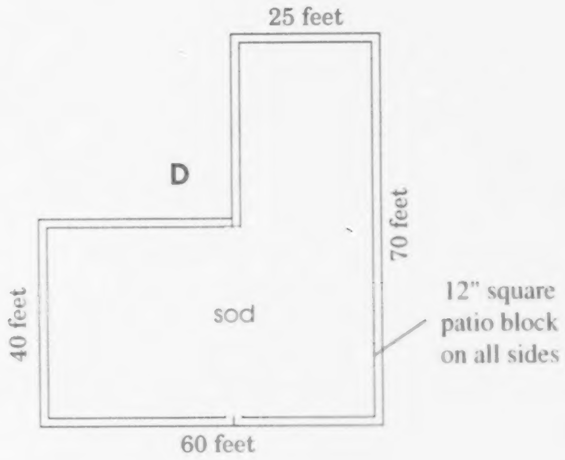
pool diameter 10 feet

C

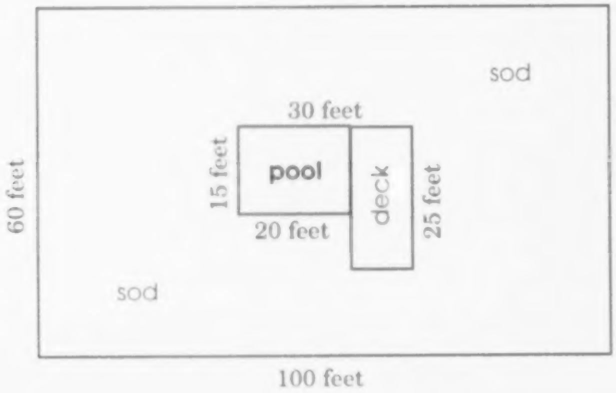

mulch
sod
30 feet
45 feet

mulch bed 2 feet wide

D


25 feet
70 feet
40 feet
sod
60 feet
12" square patio block on all sides

E


sod
30 feet
15 feet
pool
deck
25 feet
20 feet
60 feet
sod
100 feet

A ____________________

B ____________________

C ____________________

D ____________________

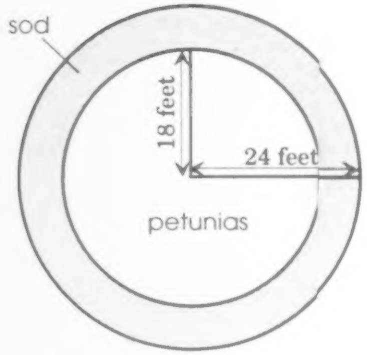
E ____________________

(continued)

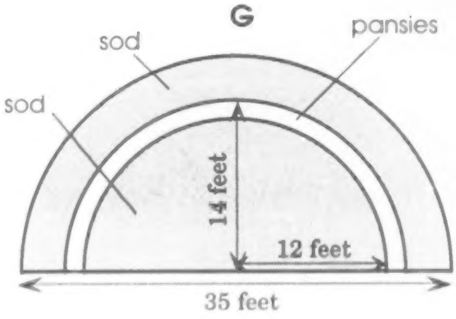
Chapter 5, Practice Set 5 *(page two)*

Find how many yards of sod are needed for projects **F** through **J** and fill in the blanks below. *(continued)*

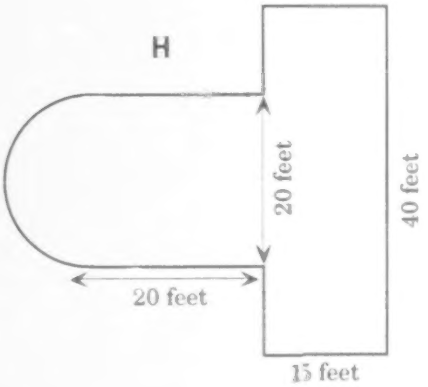
F


sod
18 feet
24 feet
petunias

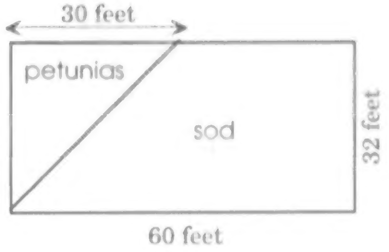
G


sod
pansies
sod
14 feet
12 feet
35 feet

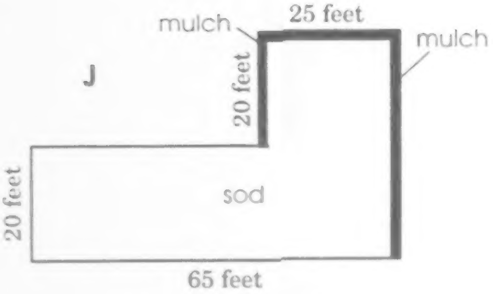
H


20 feet
40 feet
20 feet
15 feet

I


30 feet
petunias
sod
32 feet
60 feet

J


mulch
25 feet
mulch
20 feet
20 feet
sod
65 feet

mulch bed 3 feet wide

F ____________

G ____________

H ____________

I ____________

J ____________

Chapter 5, Practice Set 6

Part A Answer the following questions referring to Tables 5-2 through 5-5 and fill in the blanks.

1. How much *Do-em-in* liquid should be mixed with the following?

   a) 6 gallons of water ________

   b) 12 gallons of water ________

   c) 3 gallons of water ________

   d) 24 gallons of water ________

2. How much *So-long Weeds* liquid should be used as follows?

   a) to treat 300 square feet ________

   b) mixed with 4 ½ gallons of water ________

   c) mixed with 1 gallon + 1 pint of water ________

   d) mixed with 9 gallons of water ________

3. How much liquid insecticide should be mixed with the following?

   a) 25 gallons of water if the recommended ratio is 100 gallons of water to 1 pint of insecticide ________

   b) 50 gallons of water if the recommended ratio is 6 ¼ gallons of water to 1 tablespoon of insecticide ________

   c) 100 gallons of water if the recommended ratio is 3 ⅛ gallons of water to 2 tablespoons of insecticide ________

   d) 6 ¼ gallons of water if the recommended ratio is 50 gallons of water to ½ pint of insecticide ________

4. How much dry insecticide should be mixed with the following?

   a) 50 gallons of water if the equivalent ratio is 1 pound of insecticide to 100 gallons of water ________

   b) 25 gallons of water if the equivalent ratio is 1 pound of insecticide to 50 gallons of water ________

   c) 6 ¼ gallons of water if the equivalent ratio is 1 pound of insecticide to 25 gallons of water ________

   d) 3 ⅛ gallons of water if the equivalent ratio is 8 ounces of insecticide to 50 gallons of water ________

(continued)

Chapter 5, Practice Set 6 *(page two)*

5. How much liquid insecticide should be mixed to produce the following?

   a) a ¼% solution if the equivalent ratio is 3 gallons of water to ¼ pint of insecticide

   b) a 2% solution if the equivalent ratio is 5 gallons of water to ¾ cup of insecticide

   c) a 4% solution if the equivalent ratio is 100 gallons of water to 1 quart of insecticide

   d) a ½% solution if the equivalent ratio is 1 gallon of water to 3 tablespoons of insecticide

Part B Complete this table.

Amount of Chemical Needed	Total Amount of Spray Desired	Quarts of Water Needed
2 quarts	5 gallons	1
1 quart	4 gallons	2
1 pint	6 gallons	3
3 pints	5 gallons	4
5 pints	20 gallons	5
32 ounces	1 gallon	6
48 ounces	2 gallons	7
¾ quart	4 gallons	8
1 ½ pints	6 gallons	9
3 quarts	10 gallons	10
7 pints	14 gallons	11
2 ½ quarts	8 gallons	12
4 pints	5 gallons	13

Answer each question and fill in the blanks.

1. An herbicide is applied 2 quarts per acre. 1 gallon of diesel oil and enough water is added to make 4 gallons of spray. How much water is needed to make the 4-gallon spray? ______________

2. An insecticide is applied in the ratio of 3 pints per acre. 1 quart of diesel oil and enough water is added to make 3 gallons of spray. How much water is needed to make the 3-gallon spray? ______________

3. An insecticide is applied in the ratio of 1 quart per acre. ½ gallon of diesel oil and enough water is added to make 5 gallons of spray. How much water is needed to make the 5-gallon spray? ______________

4. An herbicide is applied in the ratio of ¼ gallon per acre. ¾ gallon of diesel oil and enough water is added to make 6 gallons of spray. How much water is needed to make the 6-gallon spray? ______________

5. A certain insecticide is applied in the ratio of 2 quarts per acre. How much would be used on a plot 150 feet by 220 feet? ______________

6. The label on an insecticide container reads: "Apply 10 lb per acre." The area to be treated measures 75 feet by 125 feet. How much insecticide is needed? ______________

(continued)

7. The label on an insecticide container reads: "Apply 3 quarts per acre." How much insecticide is needed to treat a plot that measures 130 feet by 120 feet? __________

8. An insecticide is applied in the ratio of 2 quarts per acre. The insecticide is usually mixed with 1 gallon of diesel oil and enough water for a 4-gallon total spray per acre. What amounts of diesel oil and water will be needed for a plot 150 feet by 220 feet? __________ __________

9. The label on an herbicide reads: "Apply 2 quarts per acre. Mix with 1 gallon diesel oil and enough water to make a 5-gallon solution." How much chemical, oil, and water are needed to treat a plot of ground 200 feet by 175 feet? __________ __________ __________

10. A particular insecticide is applied at the ratio of 1.75 quarts per acre. It must be mixed with 0.75 gallon of diesel oil and enough water to make a 4-gallon total spray. How much of each is needed to treat ⅓ acre? __________ __________ __________

11. A second application of an insecticide (question 10) is needed, but the amount will be reduced this time to 2 pints per acre. The amount of oil remains the same, and the total spray will remain at 4 gallons. How much of each ingredient will be needed to treat the ⅓ acre with a second application? __________ __________ __________

12. The label on an herbicide reads: "Apply 3 pints per acre. Mix with 2 quarts of diesel oil and enough water to make a 3-gallon solution." How much of each is needed to treat a plot 220 feet by 250 feet? __________ __________ __________

Chapter 5, Practice Set 8

Answer these questions and fill in the blanks.

1. How many pounds of nitrogen (based on a 10-6-4 formula) would be needed for one application to a tree with an 11-inch-diameter trunk? __________

2. How many pounds of 10-6-4 formula mix would be needed for one application to a 5-inch-diameter tree? __________

3. You are to use a 10-6-4 fertilizer on an 8-inch-diameter tree. How many pounds of each chemical should be included in the mix for one application?

N __________

P __________

K __________

4. How much filler is needed for one application of 10-6-4 fertilizer to a 13-inch-diameter tree? __________

5. A tree has a canopy 24 feet in diameter. How many pounds of 10-6-4 fertilizer would be needed for one application? __________

6. How much 30-12-12 fertilizer is needed for one application to a tree with a canopy of 55 feet? __________

7. How many pounds of a 10-6-4 fertilizer mix are needed for one application to a tree with a 40-foot canopy? __________

8. How many pounds of a 20-16-12 fertilizer mix are needed for one application to a tree with a 40-foot canopy? __________

9. How many pounds of nitrogen are needed for one application to a tree with a 35-foot canopy using a 16-12-10 fertilizer mix? __________

10. How much filler is needed for one application of a 10-6-4 fertilizer mix to a tree with a 50-foot canopy? __________

11. How much nitrogen does a tree with a 20-foot canopy need for one application of a 16-12-10 fertilizer mix? __________

1. Find the number of pounds of fertilizer needed for one application to each tree in this table.

Diameter of Canopy	Fertilizer Formula	Pounds of Fertilizer
21 feet	16-12-10	a ____________
35 feet	10-6-4	b ____________
50 feet	28-16-12	c ____________
29 feet	16-12-10	d ____________
42 feet	10-6-4	e ____________

2. Complete the following table, giving the chemical breakdown of each bag of fertilizer.

Size	Formula	Nitrogen	Potassium	Phosphorus	Filler
50 lb	10-6-4	________	________	________	________
30 lb	16-12-10	________	________	________	________
75 lb	30-12-12	________	________	________	________
90 lb	28-16-12	________	________	________	________
100 lb	19-16-12	________	________	________	________
125 lb	20-15-10	________	________	________	________

3. How many pounds of phosphorus are there in a 65-pound bag of 30-12-12 fertilizer? ____________

4. How much filler is there in a 50-pound bag of 21-5-7 fertilizer mix? ____________

(continued)

5. How much nitrogen will you find in a 90-pound bag of 6-12-18 fertilizer mix? __________

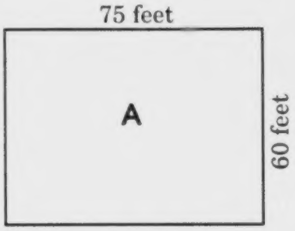
6. How much potassium will you find in a 25-pound bag of 24-30-12 fertilizer mix? __________

7. How much filler will you find in a 25-pound bag of 15-20-18 fertilizer? __________

8. Directions on a 25-pound bag of fertilizer state that the bag will cover 5000 square feet of area. How many bags will you need to fertilize a rectangular lawn 100 feet by 60 feet? __________

9. How many bags of fertilizer will you need for lawn **A** if a 20-pound bag covers 1500 square feet of area?

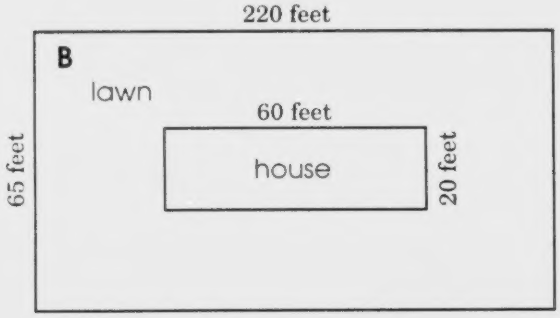
A __________

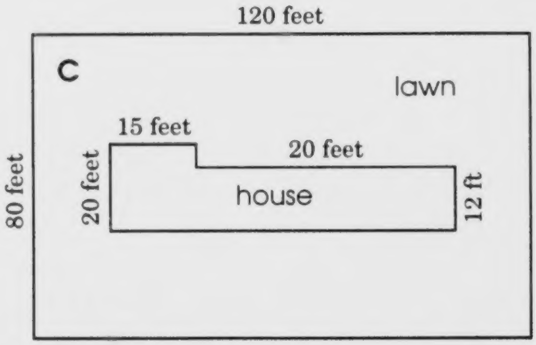

75 feet
A
60 feet

10. One 50-pound bag of a certain fertilizer covers 2500 square feet of area. How many of these bags will you need for each of the following lawns, **B** and **C**?

B __________

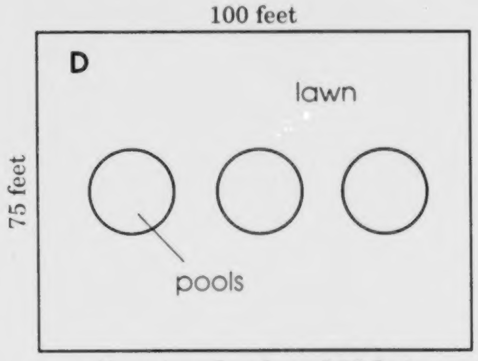
C __________


220 feet
B
lawn
60 feet
house
65 feet
20 feet

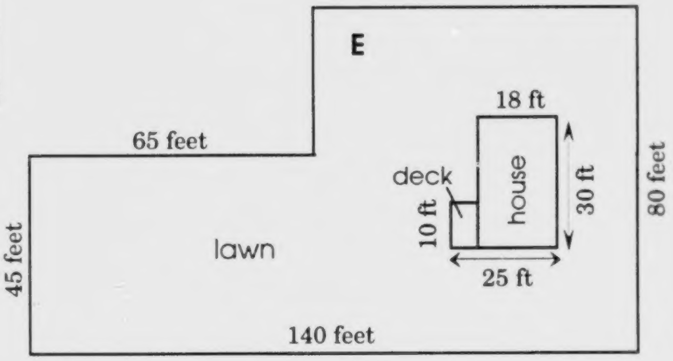

120 feet
C
lawn
15 feet
20 feet
house
80 feet
20 feet
12 ft

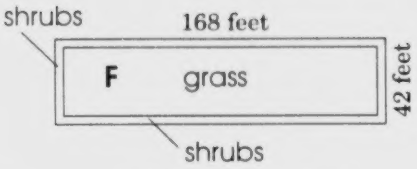
(continued)

10. One 50-pound bag of a certain fertilizer covers 2500 square feet of area. How many of these bags will you need for each of the following lawns, **D** through **G**? *(continued)*

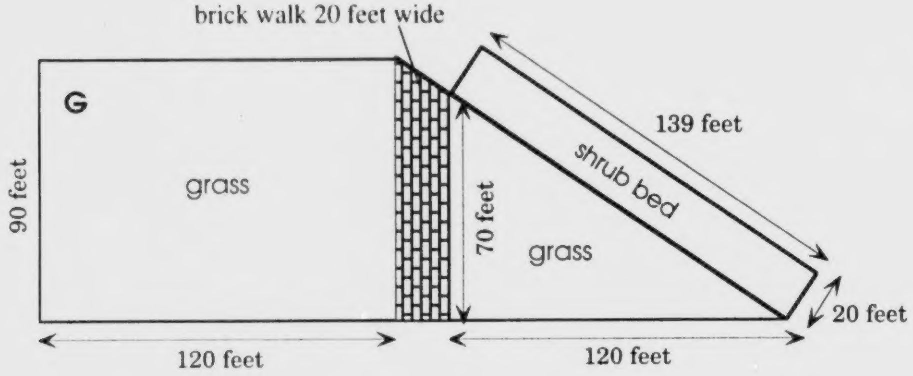

100 feet
D
lawn
75 feet
pools

diameter of each pool 20 feet


E
18 ft
deck
house
30 ft
80 feet
10 ft
65 feet
45 feet
lawn
25 ft
140 feet


shrubs
168 feet
F
grass
42 feet
shrubs

shrub bed 2 feet wide


brick walk 20 feet wide
G
139 feet
90 feet
grass
shrub bed
70 feet
grass
20 feet
120 feet
120 feet

D ______________

E ______________

F ______________

G ______________

CHAPTER 6

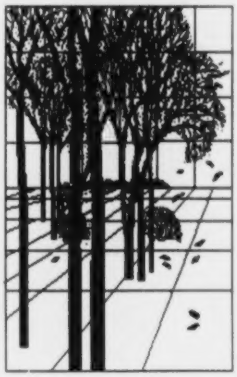
USING DRAWING SCALES AND WRITING ESTIMATES FOR LANDSCAPE PLANS

By the time you finish this chapter, you will be able to

1) make a scale drawing using the architect's scale.
2) complete a bid sheet (estimate) for a landscaping project.

* * * * * * * * * * * * * * * *

Drawing Scales



One of the most indispensable tools for a student of landscape design is the **scale** used to make drawings of landscape projects. Scale allows the designer to make drawings with the correct shapes but in convenient sizes. Drawing a given area "to scale" means translating the full-size measurements to a smaller sketch using accurate proportions. In Figure 6-1, for example, the scale used for the drawing of a formal garden is 1 inch equals 8 feet. That is, a length of 1 inch on the drawing represents 8 feet in the garden.

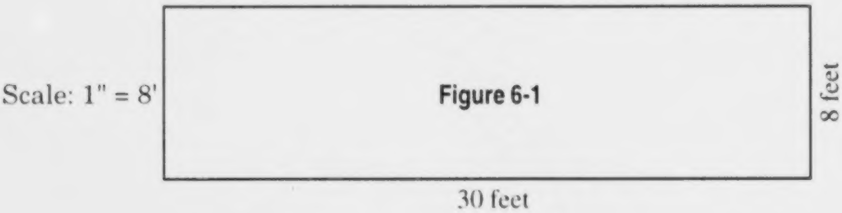


Figure 6-1

The two scales that are used today are the architect's scale and the engineer's scale.

The ***architect's scale*** (Figure 6-2) is a triangular scale with six separate faces. It divides the normal ruler measurements of 1 inch to 12 inches into fractions from 3/32 inch to 3 inches. For example, on the 1/8 scale there are 8 divisions to the inch; each division or graduation equals 1/8 inch and stands for 1 foot.

Figure 6-2 One face of an architect's scale

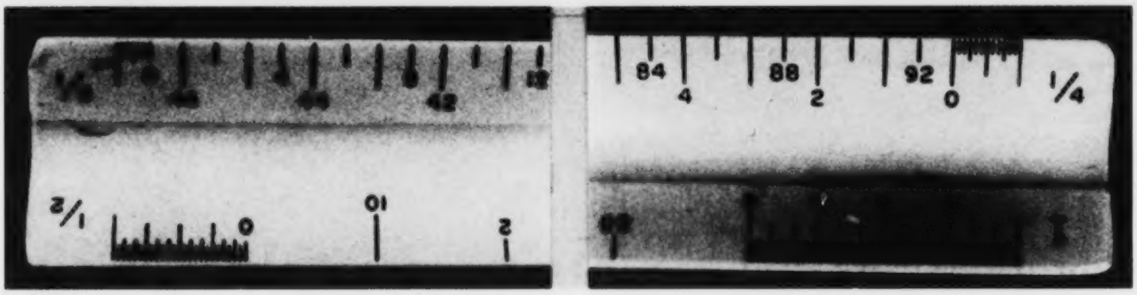
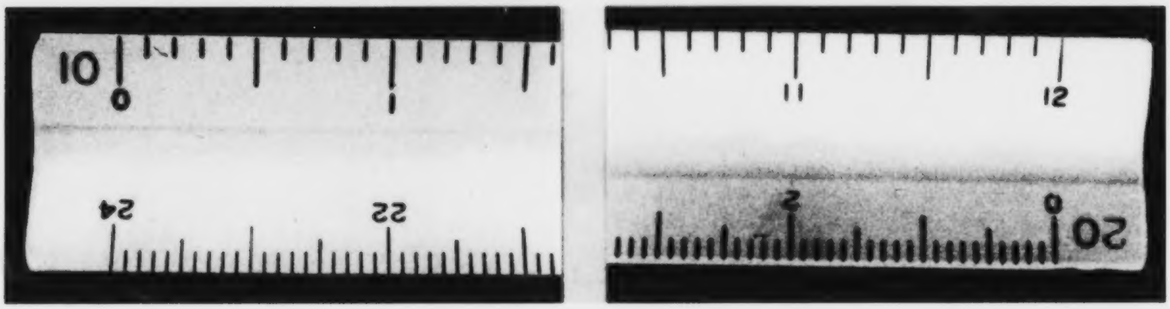


Figure 6-3 One face of an engineer's scale



The ***engineer's scale*** (Figure 6-3) is also a triangular scale with six separate faces. Each ruler face is divided into multiples of ten. For example, each graduation on the 10 scale is equal to 1 unit and there are 10 units to the inch. On the 20 scale, each graduation is equal to 1 unit and there are 20 units to the inch. There are scales for 10th, 20th, 30th, 40th, 50th, and 60th, each on a separate face.

Although both scales are used for landscape design, the architect's scale is the one most widely used today. The English system of inches is still in greater favor with many people than is the metric system of tens. Also, many large landscape businesses are drawing designs with computer CAD systems. In any case, a basic knowledge of scale drawings is essential.

Look closely at Figure 6-2 and you will see two scales: the 1/8 scale in the upper left and the 1/4 scale in the upper right. On the 1/8 scale, between the first mark and the mark numbered "0" is a space that is 1/8 inch long. This space is broken down into smaller units of a foot. This section is used if a measurement like 1/2 foot or 1/4 foot is needed. When you are making standard measurements on a design, lay the "0", NOT the end of the scale, on your starting point. Notice that only the even numbers such as 4, 8, 12, 16, etc. are marked. These are read, "4 feet, 8 feet, 12 feet, 16 feet," etc.

If you are using the 1/4 scale, begin reading from the **right** end of the face of the scale. Notice the "0" mark and the finer breakdown. The graduations on the 1/4 scale are marked with longer lines than those on the 1/8 scale. Again the marks stand for feet measurements. These numbers are larger than the numbers coming from the left end of the scale and are printed below them.

The scale used to make the drawing is marked on the sketch, usually in the lower right corner. This information may be stated in several forms. Examples in this text will use the following form (for the 1/8 scale, for example):

scale: 1" = 8'

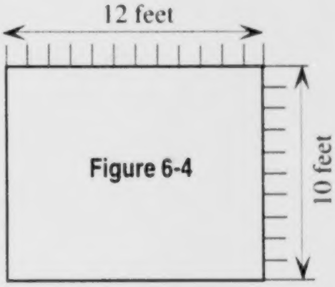


Figure 6-4

Scale: 1" = 8'

Example 1

A rectangular plot is 12 feet by 10 feet.

A. Use the 1/8 scale to sketch it. (Figure 6-4)
- 12 marks on the scale equals 12 feet.
- 10 marks on the scale equals 10 feet.

Mark the scale used on the drawing and underline it .

B. Draw the same plot using the 1/4 scale. Notice the difference in size of the two sketches. (Figure 6-5)

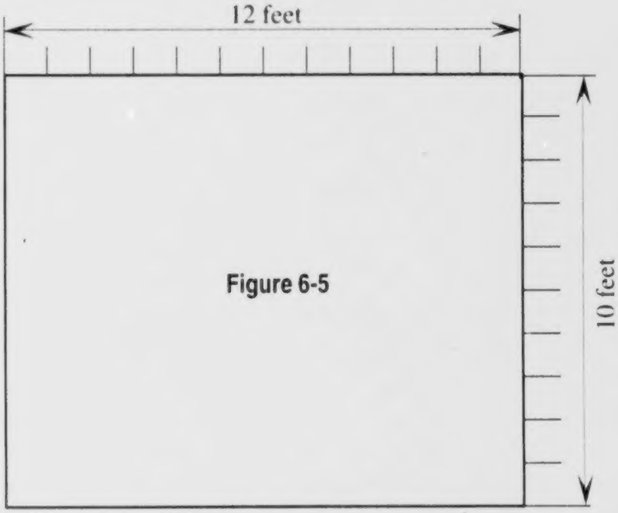


Figure 6-5

Scale: 1" = 4'

Example 2

Draw a line 8 feet long using the following scales on the architect's rule.

a) 1/8 scale
b) 1/4 scale
c) 1/2 scale
d) 3/8 scale
e) 3/32 scale

Estimates and Bids on a Project

After you have drawn a plan, you will need to prepare an estimate of the cost of the proposed job. The customers will want an estimate of the cost involved in installing the plan. They will also want an estimate of the cost for the materials only, since they may plan to do the work themselves.

The exercises in the practice sets at the end of this chapter are designed to give you some experience in preparing bids for landscape projects. Decide what you think the client wants to complete the design. Use the forms your instructor gives you to prepare the bid for the project. (See pages 219-220 for blank sample bid sheets.) Do your figuring neatly on a separate worksheet and attach it to the bid sheet. Be sure to give complete information, such as the customer's name, address, and telephone number. Get in the habit of preparing forms accurately, completely, and neatly so that your company can be proud of your work. Try to think of these exercises as being real bids - work that will be needed for the coming spring and summer.

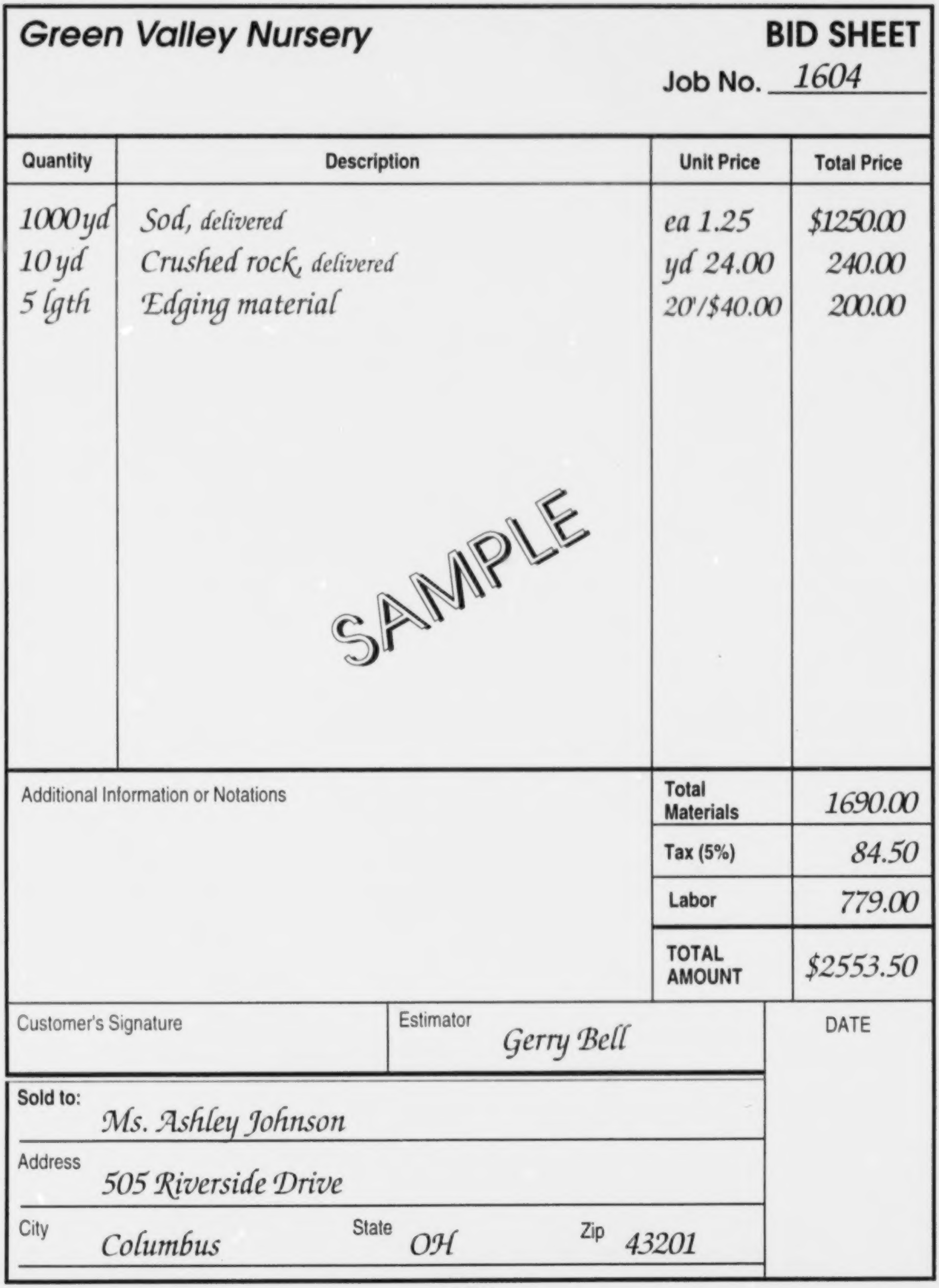
Competition and actual practice in the field may be very different from work in the classroom. There are a number of factors that will influence what you bid and estimate:

- where you live,
- how much money the client has to spend, and
- whether the client intends to do the work alone or have your company install the project.

Completing a bid sheet is similar to filling out a sales slip for a customer. You will need to write down the name and address of the client and a list of the materials needed, their quantities and prices. You must also include a charge for labor. This is the fee the company charges for installing the project. Some landscape firms charge a fee for labor that is equal to the cost of the materials used. Others charge a percentage of the cost of the materials for the labor fee.

Look at the sample bid sheet in Figure 6-6. Notice that all materials needed are listed and the quantities are shown. As on a sales slip, the price per item and the total for each of these items is calculated. Notice that the charge for labor is shown as a separate item. Also, the sales tax is calculated only on the materials, not on the labor. Finally, the customer's name and address are shown along with the name of the employee who prepared the estimate.

Figure 6-6



Green Valley Nursery

BID SHEET

Job No. 1604

Quantity	Description	Unit Price	Total Price
1000yd	Sod, delivered	ea 1.25	$1250.00
10 yd	Crushed rock, delivered	yd 24.00	240.00
5 lgth	Edging material	20'/$40.00	200.00

Additional Information or Notations

Total Materials	1690.00
Tax (5%)	84.50
Labor	779.00
TOTAL AMOUNT	$2553.50

SAMPLE

Customer's Signature

Estimator Gerry Bell

DATE

Sold to: Ms. Ashley Johnson

Address 505 Riverside Drive

City Columbus

State OH

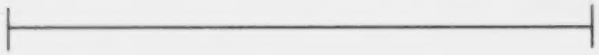
Zip 43201

Chapter 6, Practice Set 1

1. Using the architect's scale, draw lines of the length given in each example, **a** through **j**. Mark the scale used and the distance measured.

Scale	Length	
1/8	18 ft	**a**
1/4	20 ft	**b**
1/2	6 ft	**c**
3/16	15 ft	**d**
3/8	12 ft	**e**
3/16	8 ft	**f**
1/4	10 ft	**g**
1/8	30 ft	**h**
1/2	8 ft	**i**
3/16	12 ft	**j**

2. Measure this line using the scales **a** through **e** and fill in the blanks.



a 3/32 scale ____________

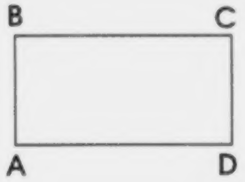
b 1/2 scale ____________

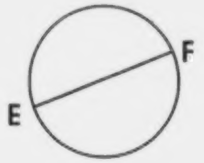
c 1/4 scale ____________

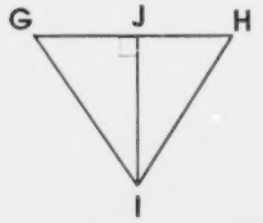
d 3/8 scale ____________

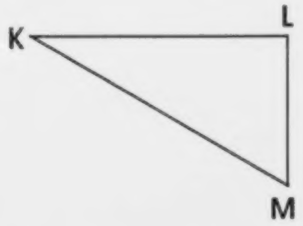
e 3/16 scale ____________

3. Using the 1/8 scale on the architect's rule, measure the line segments shown in the figures below and fill in the blanks.









line segments

a $\overline{AB}$ ____________

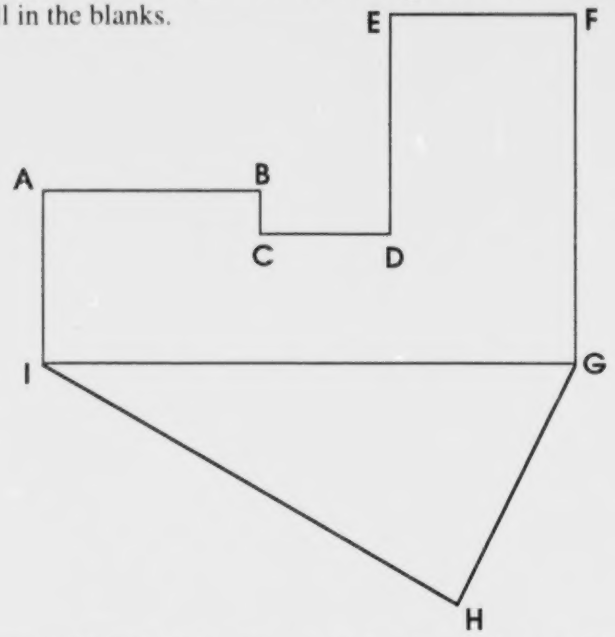
b $\overline{EF}$ ____________

c $\overline{IJ}$ ____________

d $\overline{KM}$ ____________

(continued)

4. Using the 1/4 scale, determine the length of the following line segments of this design. Fill in the blanks.



a $\overline{AB}$ __________

b $\overline{BC}$ __________

c $\overline{CD}$ __________

d $\overline{DE}$ __________

e $\overline{EF}$ __________

f $\overline{FG}$ __________

g $\overline{GH}$ __________

h $\overline{HI}$ __________

i $\overline{GI}$ __________

j $\overline{AI}$ __________

5. Draw and label a line segment 36 feet long using the 3/32 scale.

6. What does each of the following mean when used on a landscape drawing?

a scale: 1" = 8' ____________________

b scale: 1" = 4' ____________________

c scale: 1" = 16' ____________________

d scale: 1" = 2' ____________________

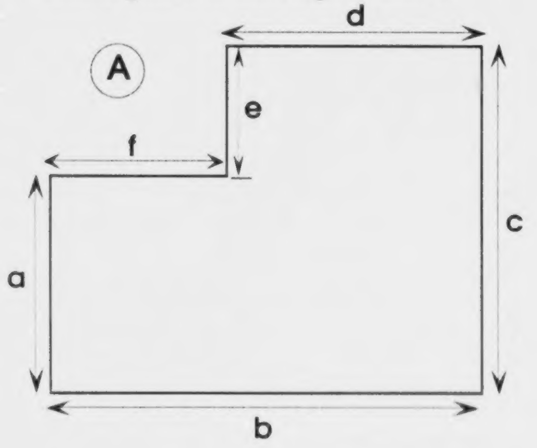
e scale: 3" = 32' ____________________

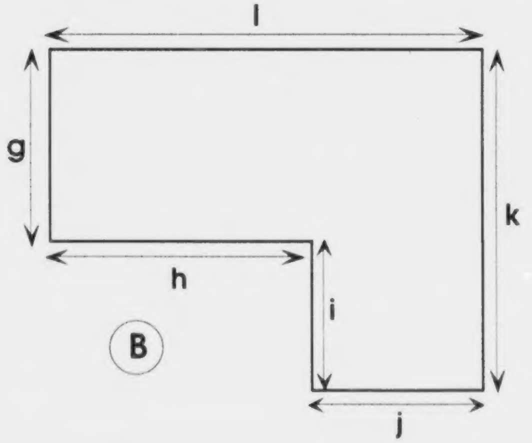
7. Using the 1/8 scale, complete this table.

Scale Reading	**Actual Length of Line in Inches**	**Scale Reading**	**Actual Length of Line in Inches**
Example: 40 feet	5 inches		
28 feet	**a** ________	22 feet	**f** ________
18 feet	**b** ________	82 feet	**g** ________
12 feet	**c** ________	14 feet	**h** ________
48 feet	**d** ________	7 feet	**i** ________
10 feet	**e** ________	26 feet	**j** ________

Chapter 6, Practice Set 2

1. Use the 1/4 scale on the architect's rule to find and record in the spaces below the length of each segment in drawings **A** and **B**.





a ______________________

b ______________________

c ______________________

d ______________________

e ______________________

f ______________________

g ______________________

h ______________________

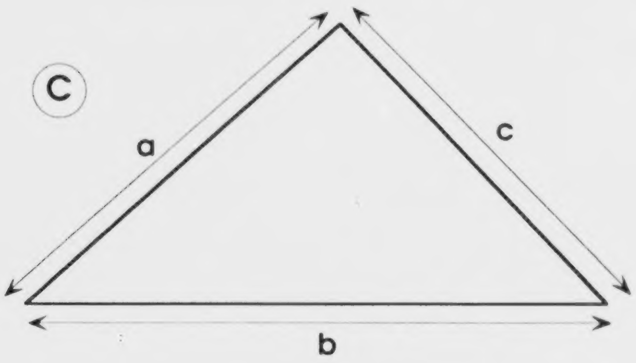
i ______________________

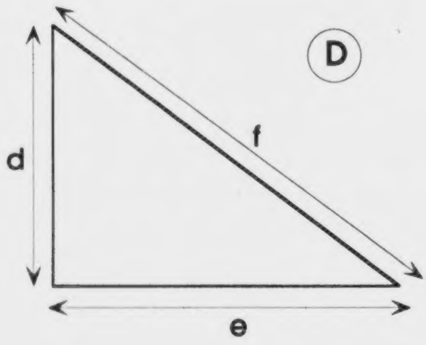
j ______________________

k ______________________

l ______________________

2. Use the 1/8 scale on the architect's rule to find and record below the length of each segment in drawings **C** and **D**.





a ______________________

b ______________________

c ______________________

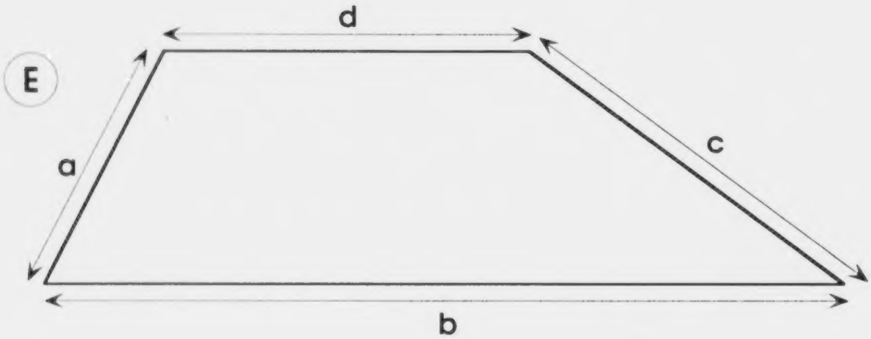
d ______________________

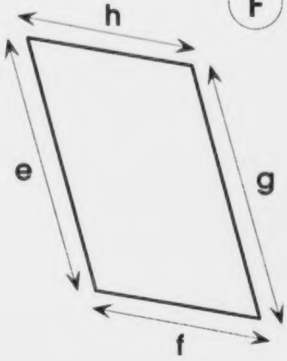
e ______________________

f ______________________

(continued)

3. Use the 3/32 scale on the architect's rule to find and record below the length of each segment in drawings **E** and **F**.





a ______________________

b ______________________

c ______________________

d ______________________

e ______________________

f ______________________

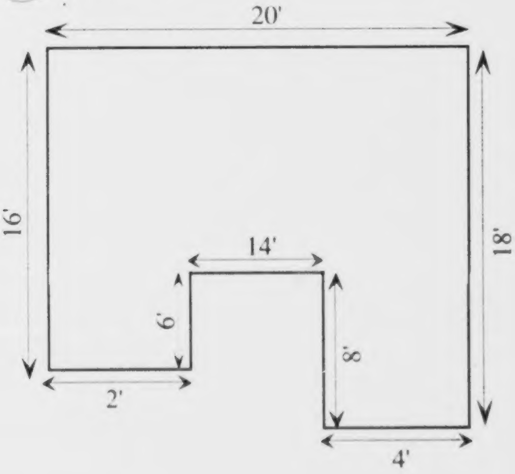
g ______________________

h ______________________

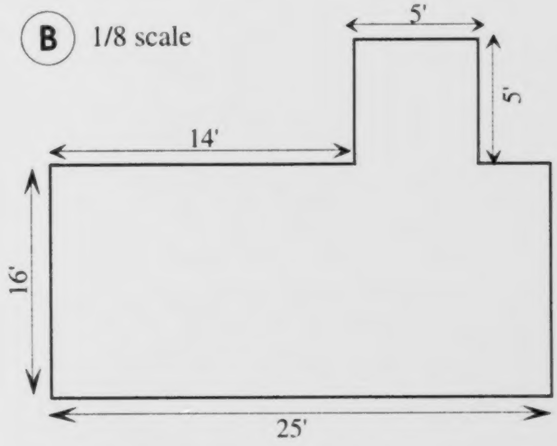
Chapter 6, Practice Set 3

Using the scale given for each example, redraw each sketch to scale on a separate sheet.

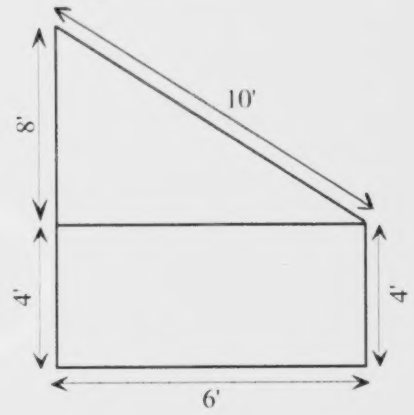
A 1/8 scale


20'
16'
14'
6'
8'
18'
2'
4'

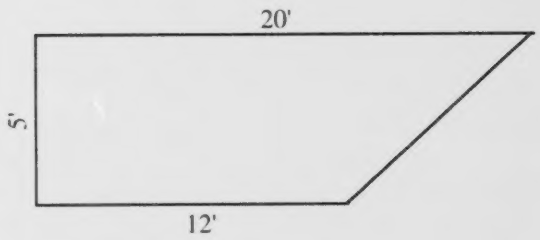
B 1/8 scale



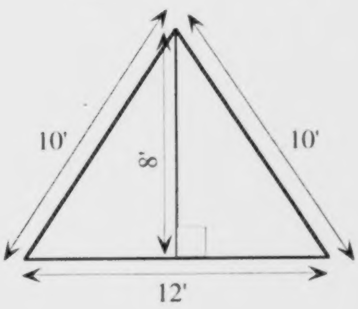
C 1/4 scale



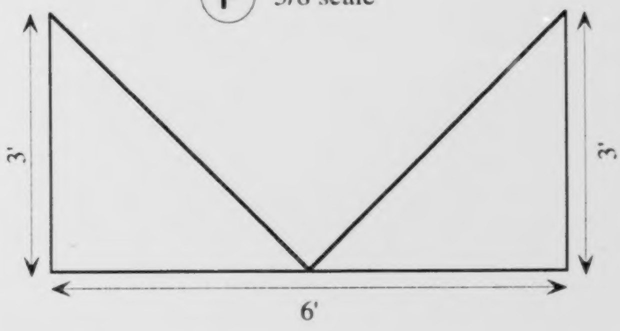
D 1/4 scale



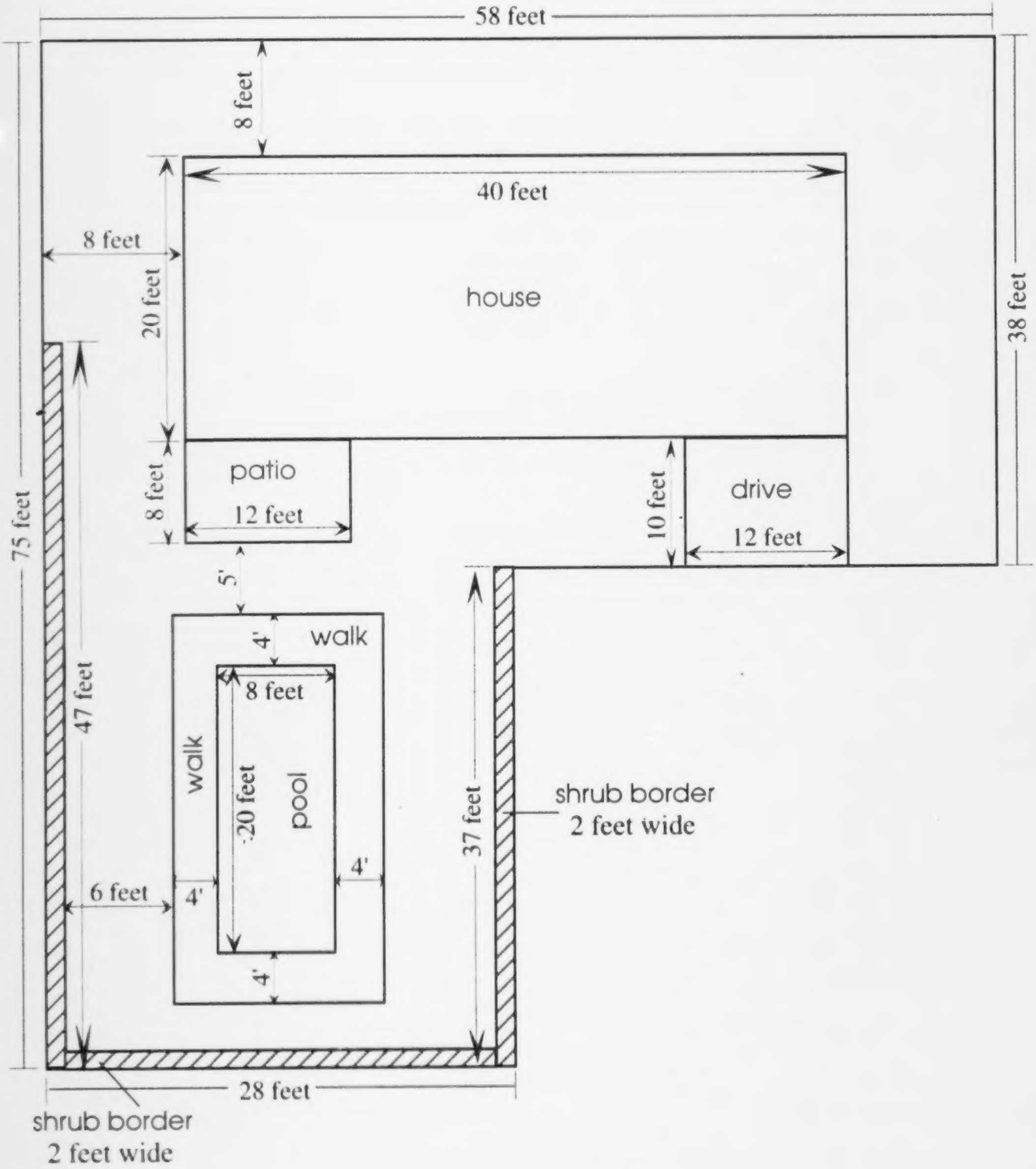
E 3/8 scale



F 3/8 scale



Use the 1/8 scale to draw this house and grounds plan to scale.


58 feet
8 feet
40 feet
8 feet
house
20 feet
38 feet
75 feet
47 feet
patio
8 feet
12 feet
drive
10 feet
12 feet
5'
walk
4'
8 feet
walk
20 feet
pool
4'
6 feet
4'
4'
37 feet
shrub border
2 feet wide
28 feet
shrub border
2 feet wide

Chapter 6, Practice Set 5

Use a bid sheet to write an estimate for the following job. Show your work for the job on a separate sheet and attach it to the bid sheet. *(See pages 219-220.)* Refer to **Plan 1**.

Remember, this is a bid. Round your answers to be practical.

Client: Jerri Smith
2118 North Street
Apple Creek, OH 44606

Client request: Cost estimate to

1. fertilize lawn
2. add 3" of hardwood mulch to shrub areas and around the tree

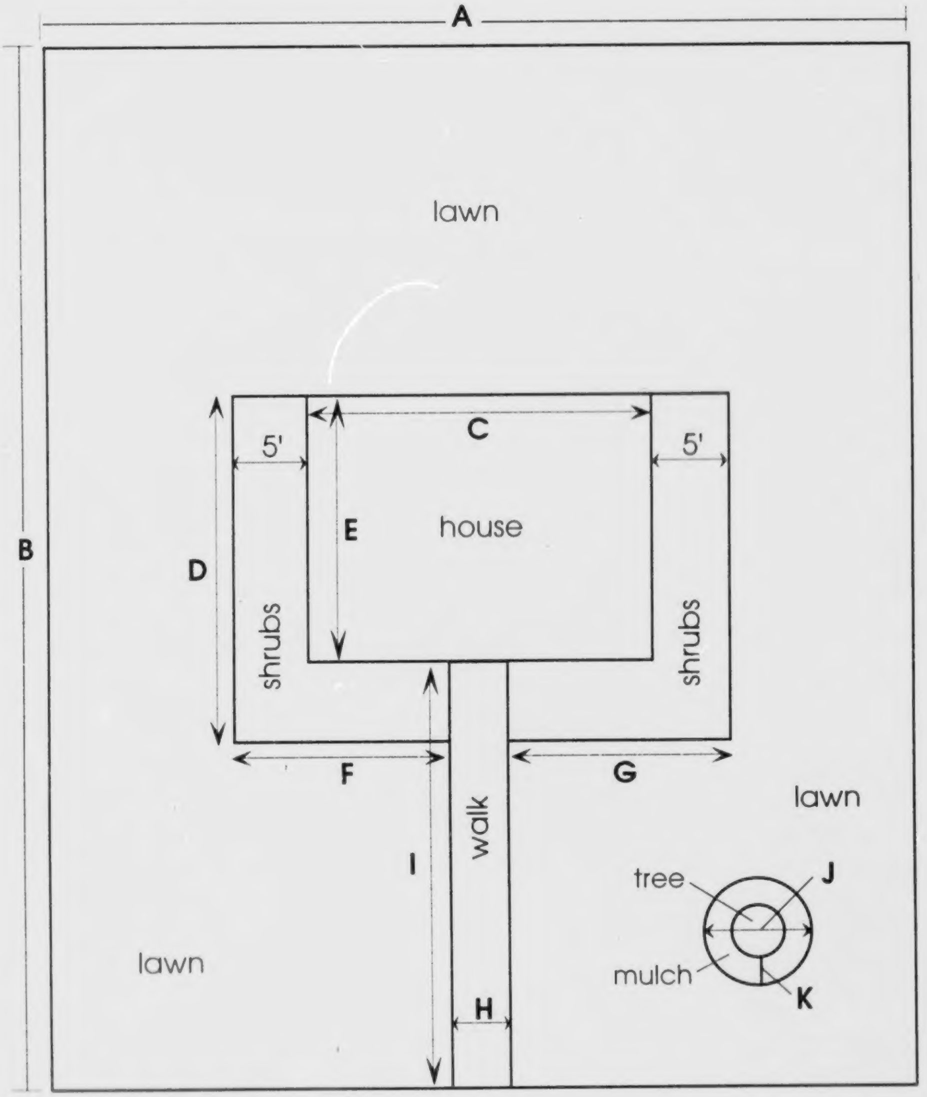
Information supplied by client Dimensions:

A = 60'
B = 90'
C = 40'
D = 40'
E = 35'
F = 23'
G = 23'
H = 4'
I = 30'
J = 8'
K = 2'

Happy Valley Nursery specifications

1. fertilizer - 25 lb/5000 sq ft @ 25 lb/$12.95
2. mulch - $20.00 per cu yd
3. labor cost - $18.00 per hour
4. tax 6% on materials only; job requires 3.5 hours.

PLAN 1


A
B
lawn
C
5'
5'
E
house
D
shrubs
shrubs
F
G
lawn
walk
I
tree
J
mulch
K
lawn
H

Use a bid sheet to write an estimate for the following job. Show your work for the job on a separate sheet and attach it to the bid sheet. *(See pages 219-220.)* Refer to **Plan 2**.

Remember, this is a bid. Round your answers to be practical.

Client: José Jackson
211 S. Elm Street
Milton, IN 47357

Client request: Cost estimate to

1. reseed lawn
2. fertilize lawn area
3. pebble mulch 4" deep

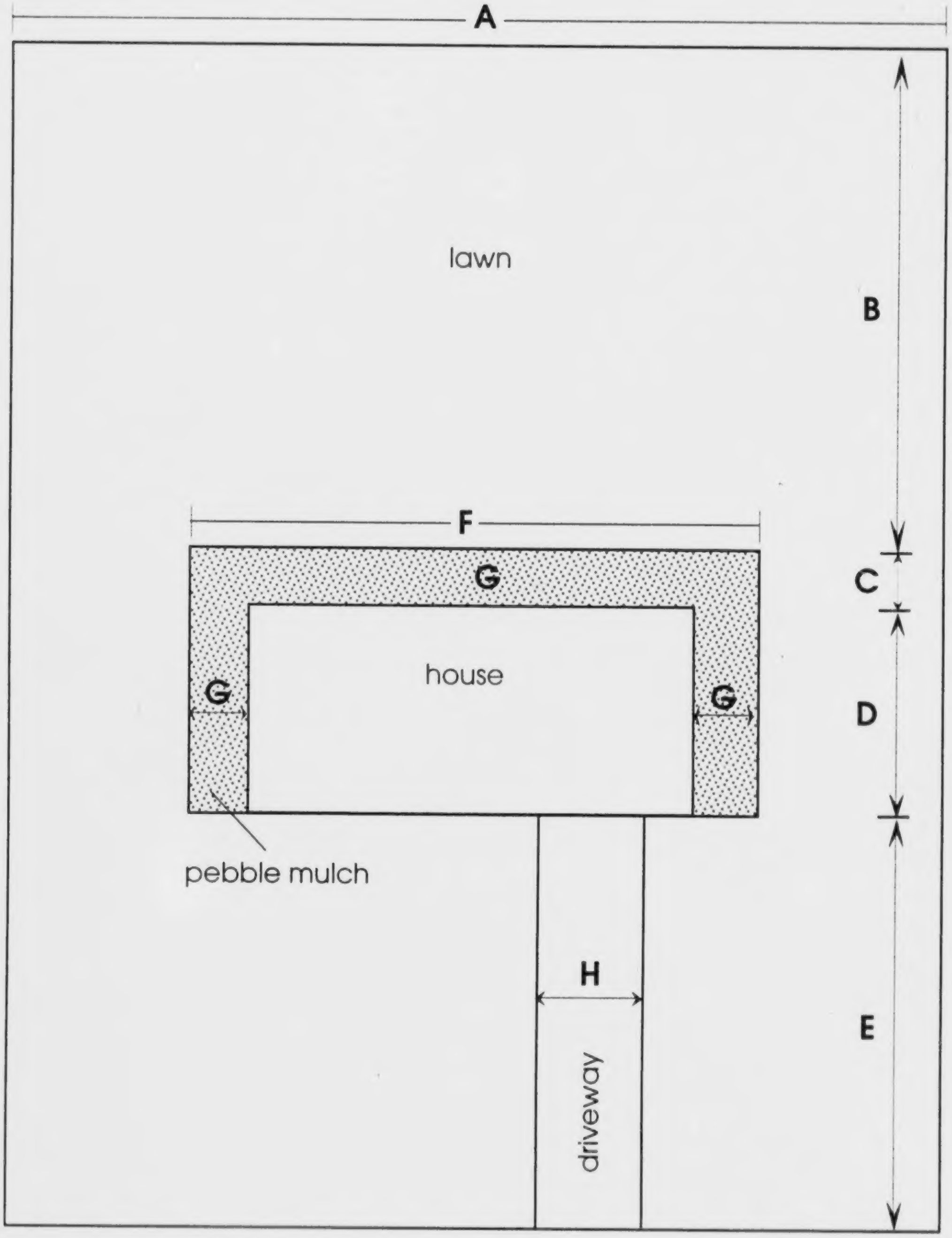
Information supplied by client Dimensions:

A = 85'
B = 77'
C = 5'
D = 28'
E = 50'
F = 76'
G = 5' wide
H = 8'

Happy Valley Nursery specifications

1. seed recommended - 4 lb/1,000 sq ft @ 10 lb/$21.00
2. fertilizer - 25 lb/5000 sq ft @ 25 lb/$12.95
3. mulch - $22.50 per cu yd
4. labor cost - $18.00 per hour
5. tax 5% on materials only; job requires 2.5 hours.

PLAN 2


A
lawn
B
F
G
C
house
G
G
D
pebble mulch
H
E
driveway

Use a bid sheet to write an estimate for the following job. Show your work for the job on a separate sheet and attach it to the bid sheet. *(See pages 219-220.)* Refer to **Plan 3**.
Remember, this is a bid. Round your answers to be practical.

Client: Joseph Grimm
45 Third Street
Maplewood, WI 54226

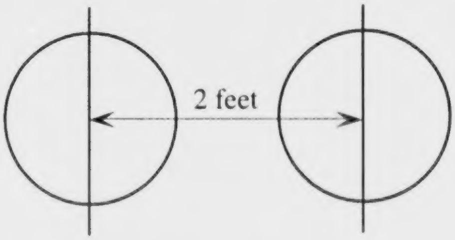
Client request: Joe Grimm is planning to add a fence and plant shrubbery in his lot. He wants mulch added to the shrubbery beds. The entire lawn needs sod; he wants that installed. He wants to build a patio out of blocks 14" square.

Information supplied by client Dimensions:

A = 60 ft
B = 120 ft
C = 40 ft
D = 35 ft
E = 30 in.
F = 130 ft
G = 75 ft
H = 50 ft
I = 35 ft
J = 25 ft
K = 15 ft

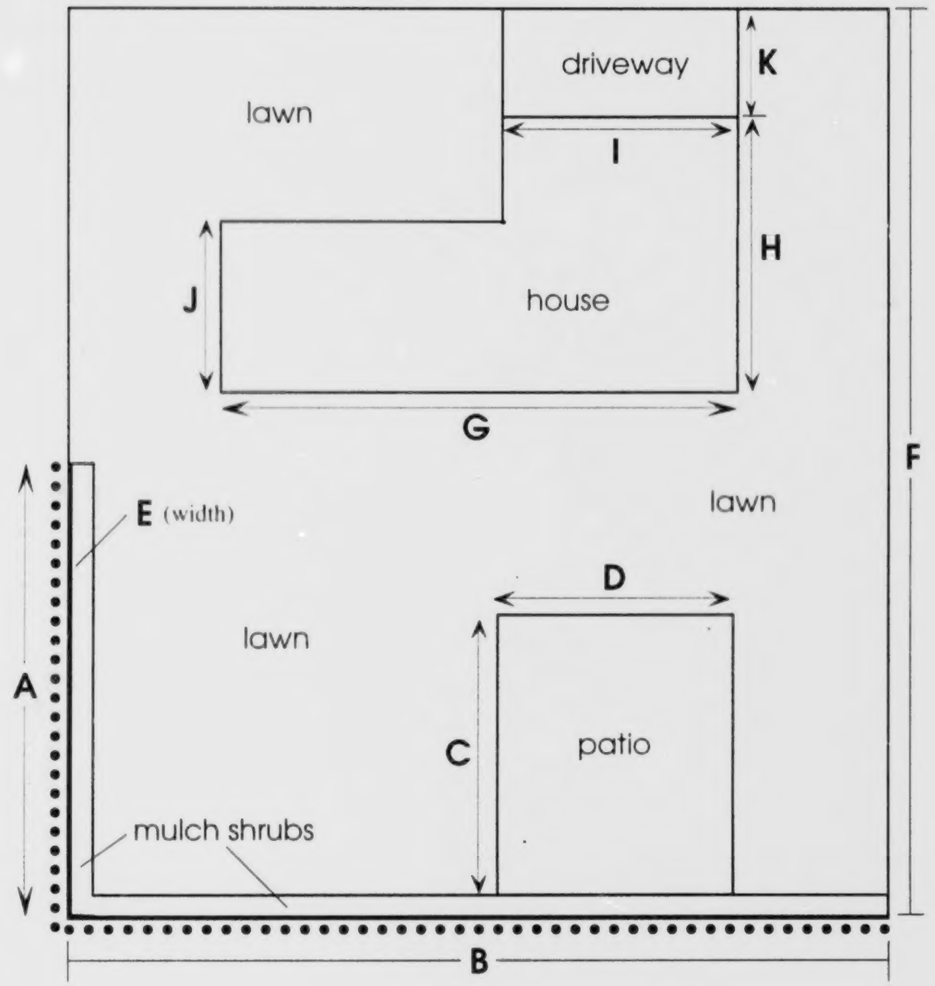
Happy Valley Nursery specifications

1. fencing to be installed along sides A and B - 6' high, 8' sections @ $23.00.
2. posts - approximately 4" by 4" square, 10' high @ $10.29. Use same post for line, end, and corner.
3. shrubs on 2' centers (that is, allowing 2' from middle of one plant to middle of next plant) - install in beds inside fencing - @ $13.95/ shrub.



4. mulch applied 4" deep @ $25 per cu yd
5. sod - $2.50 per sq yd completely installed
6. 14" square blocks - $1.79 each
7. labor cost - 75% of total material cost; 6% sales tax on materials only

PLAN 3


driveway
K
lawn
I
H
J
house
G
F
E (width)
lawn
D
lawn
A
C
patio
mulch shrubs
B

Chapter 6, Practice Set 8

Use a bid sheet to write an estimate for the following job. Show your work for the job on a separate sheet and attach it to the bid sheet. *(See pages 219-220.)* Refer to **Plan 4**.
Remember, this is a bid. Round your answers to be practical.

Client: Mr. & Mrs. Stephen Spitler
234 Ashley Avenue
Columbus, OH 43210

Client request

The Spitlers plan to install a swimming pool and adjoining patio in their backyard. Patio and 3-foot-wide pool surround are to be constructed of concrete pavers. For privacy, a mulched shrub bed, also 3 feet wide, will be installed. A new lawn is to be sowed and fertilized. Fencing (with gate at G) will be installed around the backyard.

Information supplied by client Dimensions:

A = 99'
B = 66'
C = 38.5'
D = 16.5'
E = 33'

F = 22'
G = 16.5'
H = 33'
I = 14'

J = 16.5'
K = 33'
L = 49.5'
M = 60.5'

N = 22'
O = 16.5'
P = 38.5'
Q = 44'

R = 41'
S = 96'
T = 77'
U = 16.5'

Happy Valley Nursery specifications

1. fencing - 10' sections @ $27.00

2. gate - 3.5' wide by 5.5' high @ $49.99

3. concrete pavers - $2.99 per sq ft

4. removal of sod (1") and topsoil at $15.00 per cu yd

5. backfill with crushed limestone - $24.00 per cu yd. Use 3" of limestone beneath pavers. Make pavers level with remaining sod when job is finished.

4. shrubs - on 2' centers @ $12.95

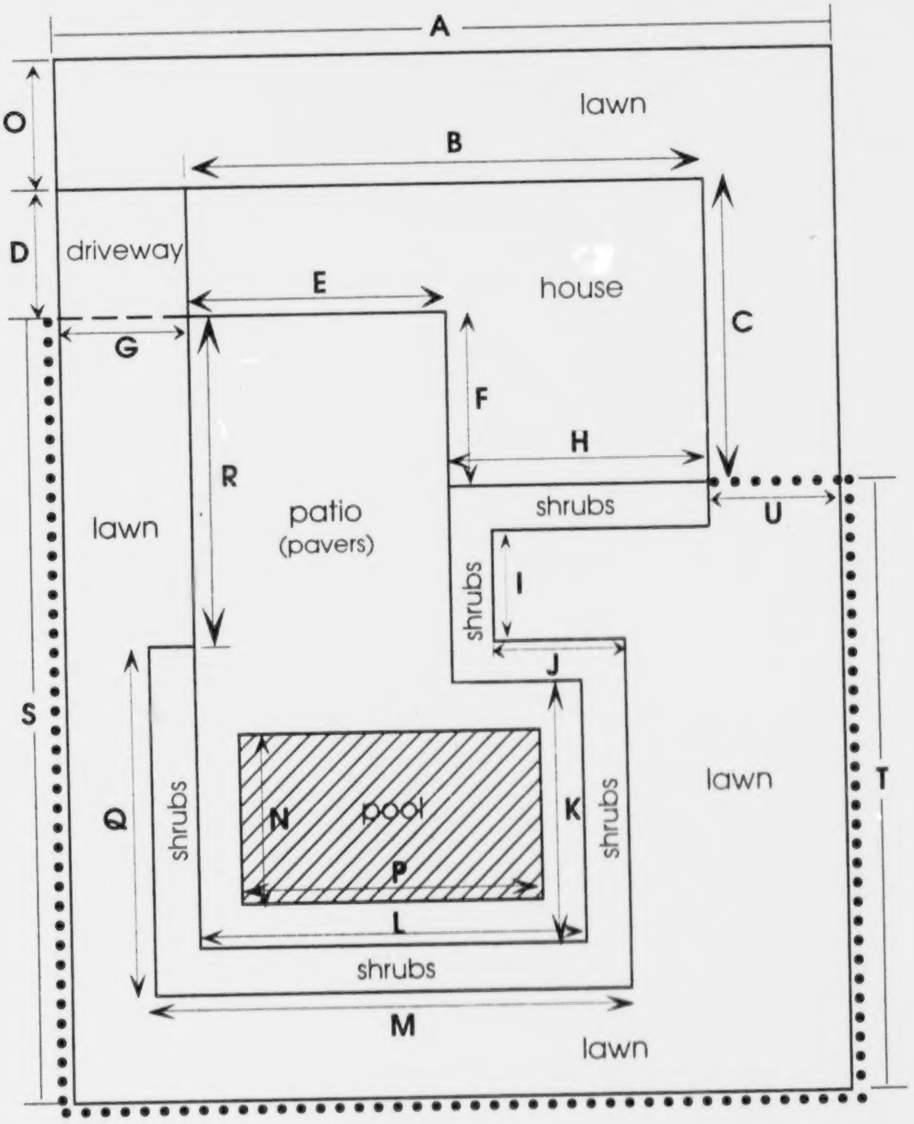
5. mulch - 3 in. deep by 3 ft wide - @$19.00 per cu yd

6. grass seed - 5 lb per 1000 sq ft @ 10 lb for $25.00

7. fertilizer for grass - 20 lb per 5000 sq ft @ 20 lb for $27.95

8. labor - charge equal to cost of materials; 5% sales tax on materials only

PLAN 4


A
lawn
B
O
D
driveway
E
house
C
G
F
H
R
shrubs
U
lawn
patio
(pavers)
shrubs
I
J
S
K
pool
N
Q
shrubs
shrubs
P
lawn
T
L
shrubs
M
lawn

Use a bid sheet to write an estimate for the following job. Show your work for the job on a separate sheet and attach it to the bid sheet. *(See pages 219-220.)* Refer to **Plan 5**.
Remember, this is a bid. Round your answers to be practical.

Client: Tom Chang
3421 Mulberry Street
Summit, NY 12175

Client request

Tom wants to add a deck with railing to the back of the house (frost line at 24") 1.5 ft above the ground. He wants annuals planted along sides of the deck as shown in the sketch. Established lawn to be reseeded. Shrubs to be installed along one side of yard. Perennial garden to be planted in corner of the lot. Add mulch to all shrubs, annuals, and perennials. Wooden fence will enclose the yard as shown. (• • • • • • • • •)

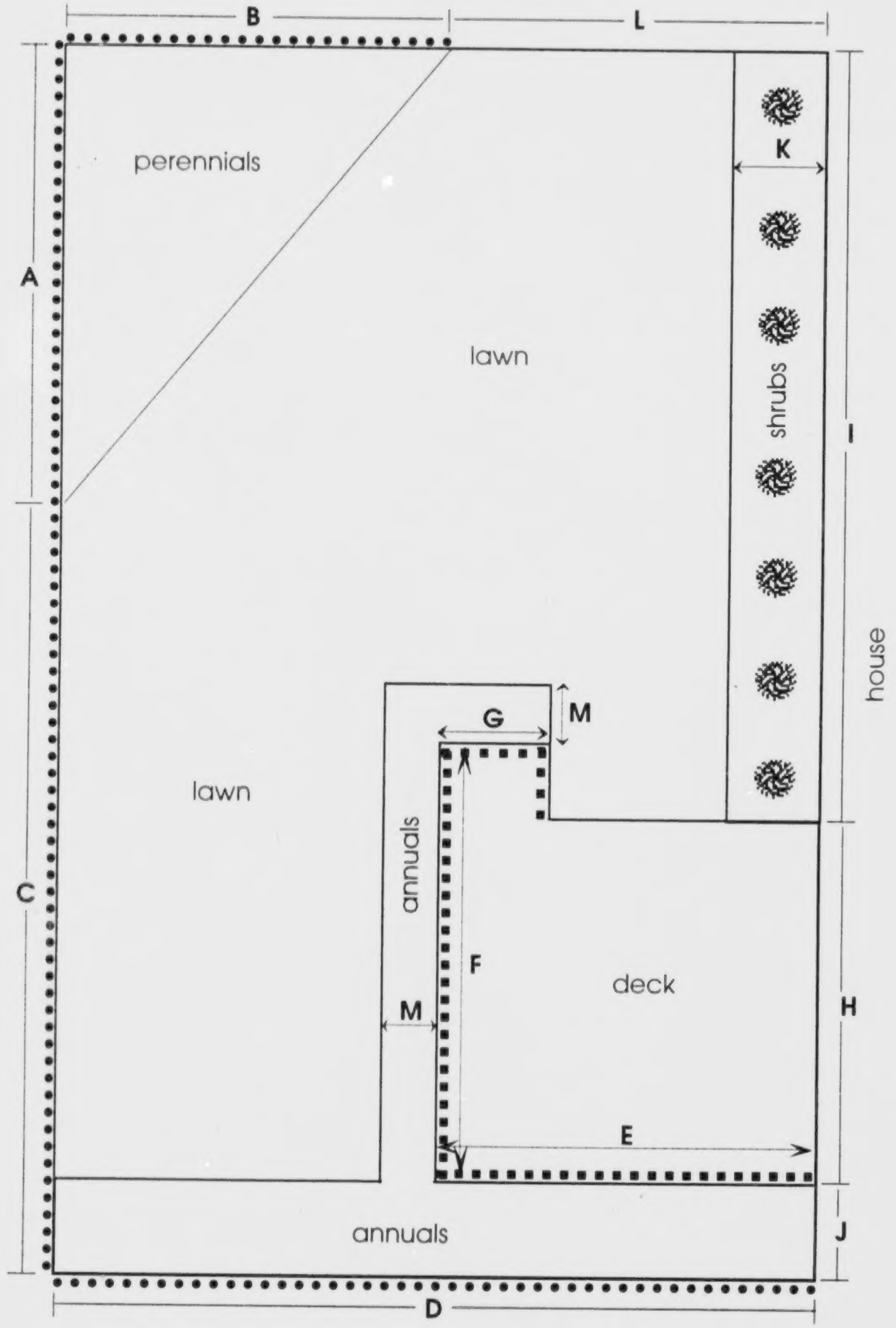
Information supplied by client Dimensions:

A = 15'
B = 12'
C = 25'
D = 25'
E = 12.25'
F = 14'
G = 3.5'
H = 12'
I = 25'
J = 3'
K = 4'
L = 13'
M = 2'

Happy Valley Nursery specifications

1. mulch - 3" deep @ $25 per cu yd
2. shrubs on 30" centers @ $18.99
3. grass seed - 4 lb/1000 sq ft @ 5 lb/$15.00
4. annuals on 12" centers @ $12.99 per flat of 48 plants
5. perennials on 15" centers @ $16.00 per dozen
6. decking: 12' boards @ $11.99
   14' boards @ $12.75
   4" x 4" x 8' posts @ $6.09
7. railing - $.99 each
8. fencing - 6' high, 10' sections @ $28.95
9. posts - 4" x 4" x 8' @ $6.09
10. labor - charge equal to cost of materials; 6% sales tax on materials only

PLAN 5


B
L
A
perennials
lawn
K
shrubs
I
house
lawn
G
M
annuals
F
M
deck
C
H
E
annuals
J
D

Chapter 6, Practice Set 10

Use a bid sheet to write an estimate for the following job. Show your work for the job on a separate sheet and attach it to the bid sheet. *(See pages 219-220.)* Refer to **Plan 6**.
Remember, this is a bid. Round your answers to be practical.

Client: Mitzi Tremain
981 Grand Boulevard
St. Clair, MI 48080

Client request

1. Fence - M. Tremain wants to enclose her property on three sides with fencing 5' high. (Side A of the property on the lakeside would not be fenced.) She would like a driveway gate and a walk gate (walk material to be chosen later). Position gate between 8' fence sections.
2. Patio - She plans a brick patio area and pool surround that will need the soil removed first. Then it will be backfilled with sand as base for the brick. Use red used brick.

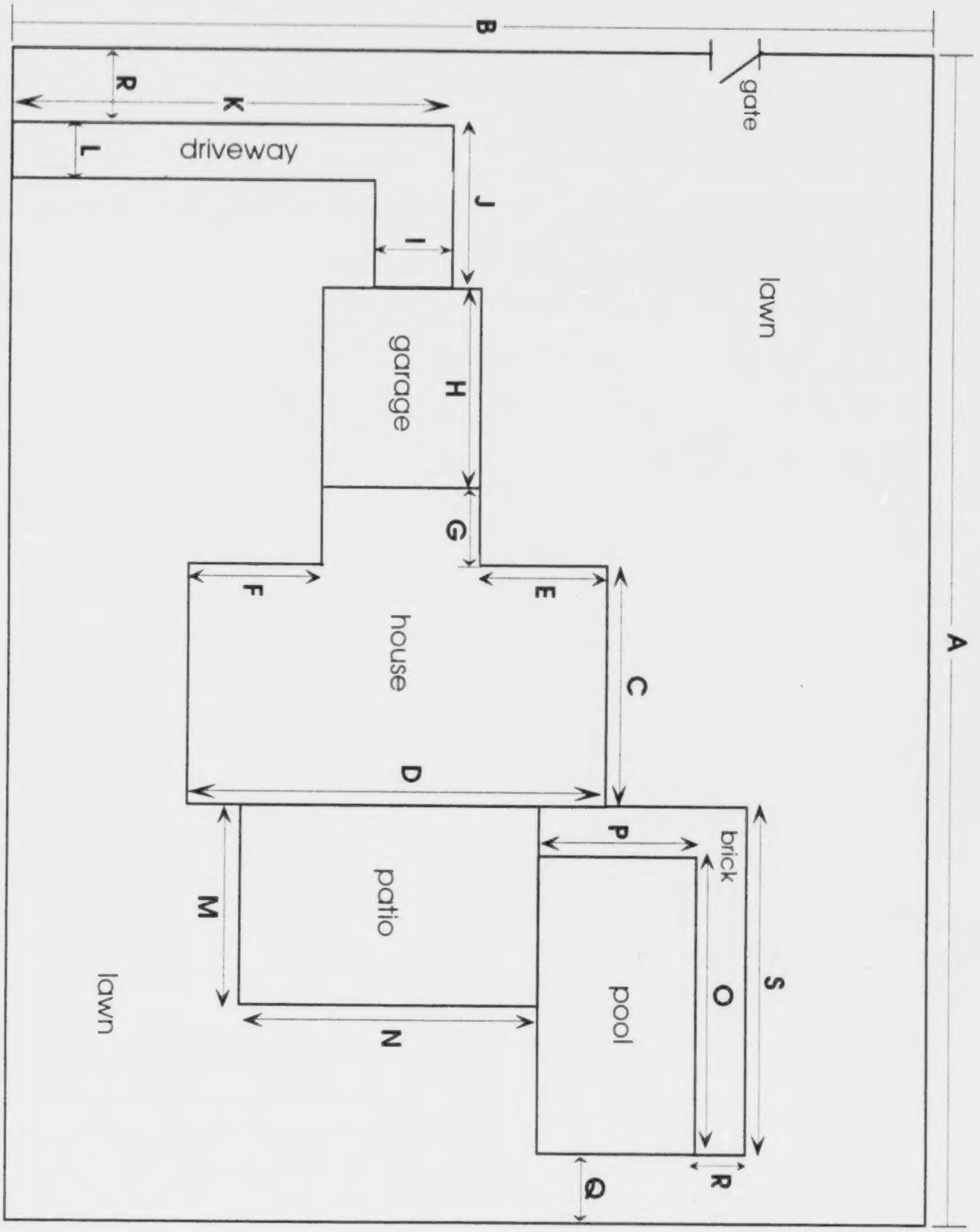
Information supplied by client Dimensions:

A = 240'
B = 200'
C = 30'
D = 85'
E = 25'
F = 25'
G = 20'
H = 30'
I = 14'
J = 50'
K = 139'
L = 14'
M = 35'
N = 55'
O = 50'
P = 30'
Q = 18'
R = 3'
S = 53'

Happy Valley Nursery specifications

1. fencing - 5' high, 8' sections @ $21.75
2. posts - approximately 4" x 4" square, 8' high @ $5.98. Use same post for line, end, corner, and gate post.
3. walk gate - 3.5' wide by 5.5' high @ $79.00
4. driveway gate - 10' wide by 5.5' high @ $149.00
5. used red brick - 5 bricks per sq ft @ $.25 each
6. removal of sod (1") and topsoil - $14.00 per cu yd
7. backfill (sand) - $24.00 per cu yd delivered. Use 4" of sand under bricks.
8. labor - charge amount equal to cost of materials; 6% sales tax on materials only

PLAN 6


A
B
gate
lawn
driveway
R
K
L
J
I
garage
H
G
F
E
house
C
D
patio
M
N
P
brick
pool
O
S
R
Q
lawn

Use a bid sheet to write an estimate for the following job. Show your work for the job on a separate sheet and attach it to the bid sheet. *(See pages 219-220.)* Refer to **Plan 7**.
Remember, this is a bid. Round your answers to be practical.

Client: Carol Brown
4567 Main Street
Cleveland, Ohio 44100

Client request

C. Brown is planning to add a fence and shrubbery to her lot. She wants advice concerning her patio, fertilization of her lawn, and crushed rock for her driveway. Give two firm bids on the work she wants done.

Bid #1

1. split-rail fencing along two sides of the property as shown on the plan.
2. shrubs along side B on 2' centers
3. patio brick of two colors in equal amounts to be placed in the outdoor patio area.
4. fertilizing lawn
5. crushed rock 3 inches deep on driveway with black plastic edging material installed.

Bid #2

Request same as for Bid #1 except as follows.

1. shrubs on both short sides of the lot and across the front.
2. a fence across the back only; include a walk gate.

Information supplied by client Dimensions:

A = 300'
B = 150'
C = 50'
D = 22'
E = 38'
F = 20'

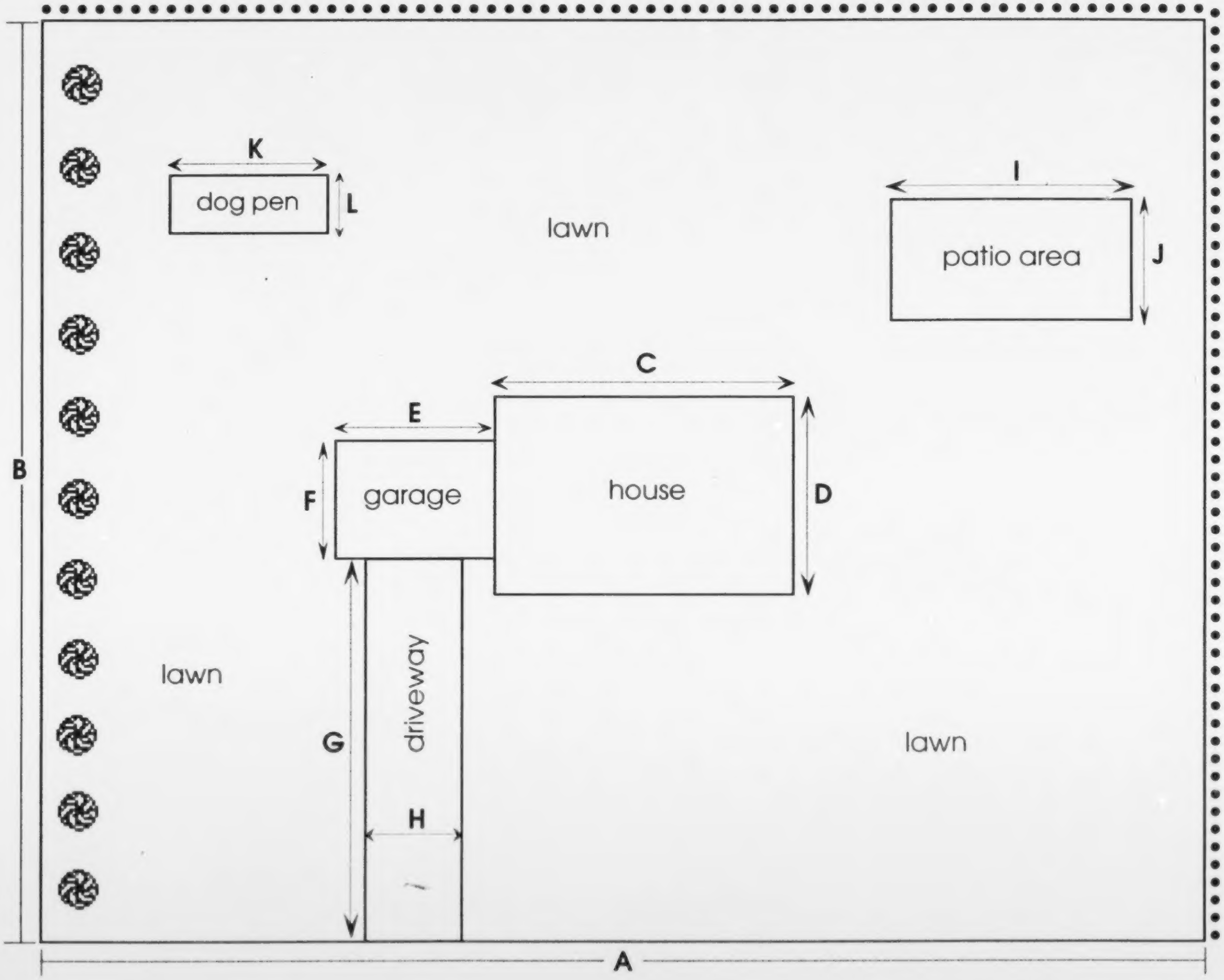
G = 52'
H = 14.5'
I = 30'
J = 15'
K = 20'
L = 8'

Happy Valley Nursery specifications

1. fencing - 5' high, 8' sections @ $21.75
2. posts - approx. 4" x 4" square, 8' high @ $5.98. Use same post for line, end, corner, and gate post.

(continued page 218)

PLAN 7


K
dog pen
L
lawn
I
patio area
J
C
E
F
garage
house
D
B
lawn
G
driveway
H
lawn
A

Refer to **Plan 7**.

Happy Valley Nursery specifications *(continued)*

3. walk gate - 3.5' wide by 5.5' high @ $79.00
4. driveway gate - 10' wide by 5.5' high @ $149.00
5. shrubs - 20 units per bundle - $1.25 per unit; sold in bundles only
6. patio bricks - 4" x 8" - red @ $.38, cream @ $.33
7. fertilizer - 25 lb/10,000 sq ft @ 25 lb/$12.95
8. crushed rock - 3" deep 1 cu yd delivered - $24.00
9. black polybutyl edging material - $2.00 per running foot installed
10. labor - charge 75% of total cost of materials; 6% sales tax on materials only

SAMPLE BID SHEET

Green Valley Nursery

BID SHEET

Job No. ____________

Quantity	**Description**	**Unit Price**	**Total Price**

Additional Information or Notations

Total Materials	
Tax	
Labor	
TOTAL AMOUNT	

Customer's Signature	Estimator	DATE

Sold to: ____________

Address ____________

City ____________ State ____________ Zip ____________

SAMPLE BID SHEET

Green Valley Nursery **BID SHEET**

Job No. ____________

Quantity	Description	Unit Price	Total Price

Additional Information or Notations	**Total Materials**	
	Tax	
	Labor	
	TOTAL AMOUNT	

Customer's Signature	Estimator	DATE

Sold to: ____________

Address ____________

City ____________ State ____________ Zip ____________

CHAPTER 7

PRODUCING A CROP FOR MARKET

By the end of this chapter, you will be able to

1) list factors that determine the cost of producing a crop for market.
2) estimate each cost factor for a crop.
3) estimate the cost of producing a crop based on your calculations.
4) determine the selling price of a crop based on your mark-up rate.

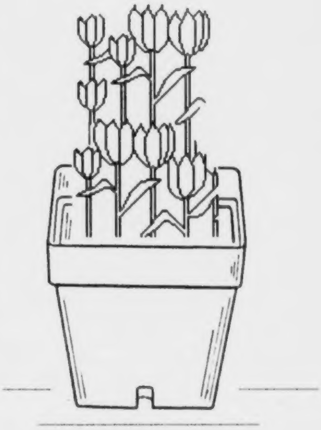
* * * * * * * * * * * * * * *

This chapter is intended to be used as a group project. With your class, you can set out to produce a crop of bedding plants for spring sale. You will identify as many of the cost factors of crop production as possible. As a class, you will analyze each factor and then calculate the total cost of producing the different plants. Enjoy the exercises and have a successful sale!

Getting Started

Producing a crop you want to market requires proper planning and hard work. You must consider all the direct costs of production - soil, pots, flats, seed or cuttings, and labor. You must also figure in the hidden costs of producing a crop - chemicals, heat, water, and electricity. There are overhead costs involved - insurance, bank payments, waste, and loss of crop. Finally, you must consider how much profit you will need to make as you plan for a successfully profitable crop.

Let's say that as manager of Valley View Nursery and Greenhouses, you are taking all these items into consideration. You start planning for the spring bedding plant sale. This year you decide to produce flowering annuals, vegetable plants, and hanging baskets. You place orders for plants and supplies as shown on the sample invoices (pages 224-225). Referring to these invoices, you must calculate production costs.



Seeds

Most flower and vegetable seed is sold by the ounce or fraction of an ounce. A few plants, like geraniums and impatiens, are even sold by the seed. Catalogs from seed companies describe in detail each kind of seed they offer (Figure 7-1). Each description gives the approximate number of seeds in an ounce, how many days that kind of seed will need for germination, the recommended temperature for germination, and how many weeks it takes to get the crop ready for market. The description may also include characteristics of the mature plant like color, size, and sun or shade preference.

Figure 7-1

Sample catalog listing

BEGONIAS
Fibrous Rooted F-1 Hybrids

Versatile bedding plant for growers and gardeners

2,000,000 seeds/oz

Culture: 70°F. 20-30 days. Sow in light, well-drained medium. Do not cover seeds. Using warm water, keep uniformly moist. Fertilize lightly with liquid feed as soon as seedlings emerge. Grow on at 60°F minimum. Provide greenhouse shade during summer months.

Timing: North packs - 15 weeks
pots - 17 weeks
South packs - 14 weeks
pots - 16 weeks

Seed is expensive. Every grower must consider the cost of seed in the selling price of the crop. To determine the cost of a particular seed, use the catalog to find the number of seeds per ounce.

- number of seeds purchased = number of seeds per ounce x amount of seed purchased (ounces or fraction of ounce)
- cost of one seed = cost of seed from order ÷ number of seeds purchased

Example 1

Invoice 1 from Klingbiel Seed Company (page 224) shows that 1/32 ounce of ageratum ('Blue Blazer') was purchased for $12.50. What is the cost of **one** of these seeds?

- 1 ounce of ageratum seed contains 200,000 seeds
- number of seeds in purchase = 200,000 x 1/32 = 6250
- cost of one seed = $12.50 ÷ 6250 = .002 (rounded up to) .01

Example 2

Invoice 1 also shows that 1/16 ounce of dusty miller ('Silverdust') was purchased for $4.05. What is the cost of **one** of these seeds?

- 1 ounce of dusty miller seed contains 90,000 seeds
- number of seeds in purchase = 90,000 x 1/16 = 5625
- cost of one seed = $4.05 ÷ 5625 = .00072
  (rounded up) = .01

Rounding

You will notice that many of these seed cost amounts are very small. However, they do represent money, so the amounts are shown rounded up to one penny ($.01).

Cuttings

Cuttings or plugs are prerooted plants sold in cell packs or flats. Often these plants are ready to transplant into hanging baskets or larger containers when they reach the merchant. Because the initial grower has assumed the cost of germinating and transplanting the seed the first time, cuttings and plugs are more expensive to the bedding plant producer than is seed. You can determine the cost of a cutting or plug by using this formula:

cost of one plug = cost of the package ÷
number of plants in the package

Example 3

Quantity	Description	Unit Price	Total
3 flats	fuchsia - springtime (92/flat)	26.00	78.00

Cost of one fuchsia plug = $26.00 ÷ 92 = **$.28**

(continued page 226)

INVOICE ①

INVOICE 234543

Valley View Nursery and Greenhouses
1236 Green Springs Road
Toledo, OH 43601

To:
Klingbiel Seed Company
P.O. Box 113
Sylvania, OH 43560
Attn. Floyd Klingbiel

Shipto:
Klingbiel Seed Company
1515 High Street
Sylvania, OH 43560
Attn. Central Distribution

Date: 6/28/96

Quantity		Description	Unit Price	Total
1	1/32 oz	ageratum - Blue Blazer	$12.50	$12.50
1	1/4 oz	alyssum - New Carpet of Snow	4.45	4.45
1	1/4 oz	aster - Powder Puff mix	3.10	3.10
1	1/8 oz	celosia - Century Fire	4.75	4.75
1	1/16 oz	celosia - Jewel box	12.15	12.15
1	1/16 oz	coleus - Rainbow Mix	27.15	27.15
1	1/16 oz	dusty miller - Silverdust	4.05	4.05
800 seeds		geranium - Orbit Salmon	94.50/1000 seeds	75.60
800 seeds		geranium - Orbit White	84.00/1000 seeds	67.20
3500 seeds		geranium - Orbit Red	84.00/1000 seeds	294.00
1	1/8 oz	impatiens - Accent Red	145.35	145.35
1	1/2 oz	marigold - Bolero	6.10	6.10
1	1/4 oz	marigold - Yellow Boy	33.85	33.85
1	1/128 oz	petunia - Supermagic White	16.00	16.00
1	1/128 oz	petunia- Supermagic Red	15.15	15.15
1	1/64 oz	petunia - Ultra Mix	23.20	23.20
1	1/2 oz	salvia - St. John's Fire	14.00	14.00
1	1/128 oz	snapdragon - Carpet Mix	17.55	17.55
1	1/4 oz	vinca - Little Mix	13.65	13.65
1	1/2 oz	broccoli - Premium Crop	24.80	24.80
1	1 oz	cabbage - Late Flat Dutch	3.80	3.80
1	1 oz	onion - Sweet Spanish	6.25	6.25
1	1 oz	pepper - Gypsy	67.00	67.00
1	1/2 oz	tomato - Better Boy, defuzzed seed	41.70	41.70
1	1/8 oz	tomato - Beefmaster	12.55	12.55

②

INVOICE 127634

Valley View Nursery and Greenhouses
1236 Green Springs Road
Toledo, OH 43601

To:
Spitler Supply Company
821 Salem Road
Delong, IN 46922
Attn. K. Starkoff

Shipto:
Spitler Supply Company
821 Salem Road
Delong, IN 46922
Attn. Central Distribution

Date: 6/21/96

Quantity	Description	Unit Price	Total
45 bags	Wonder-gro potting soil	22.95	1032.75
10 bags	Green-Glo fertilizer (20-19-18) 25 lb each	22.79	227.90
5 cases	cell packs (4-cell)	28.52	142.60
5 cases	10" baskets with wires	44.33	221.65
7 cases	4" square pots	56.72	397.04

③

INVOICE 907654

Valley View Nursery and Greenhouses
1236 Green Springs Road
Toledo, OH 43601

To:
Boor Plant Company
3917 Bowmont Street
Wooster, OH 44691
Attn. A. Boor

Shipto:
Boor Plant Company
3917 Bowmont Street
Wooster, OH 44691
Attn. Central Distribution

Date: 6/21/96

Delivery date: January 6, 1997

Quantity	Description	Unit Price	Total
3 flats	fuchsia - pink (96/flat)	25.85	77.55
4 flats	fuchsia - red (96/flat)	25.85	103.40
3 flats	begonia - red (58/flat)	24.20	72.60
3 flats	vinca vine (96/flat)	46.00	138.00
3 flats	dracena spikes (92/flat)	27.60	82.80
2 flats	ivy geranium - white (72/flat)	52.00	104.00
2 flats	ivy geranium - pink (72/flat)	52.00	104.00

Containers and Soil

Most of the vegetable and flowering plants will be sold in 4-cell cell packs. Most of the geraniums will be grown in 4" square pots. Fuchsia, begonia, and ivy geranium plants will be sold in hanging baskets. How do you calculate the total cost of one of these containers? By using figures from the invoices on pages 224-225 and the following information from manufacturers:

- Cell packs are sold in cases of 100 sheets; each sheet contains twelve 4-cell packs.
- Square pots are sold in cases of 900 pots.
- Hanging baskets are sold in cases of 60 pots.

> Cost of one container = cost of one case ÷ number of pieces in case

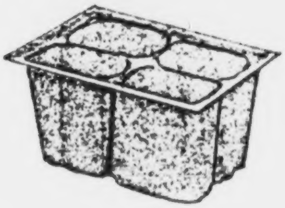
Volume of Containers

The cost of each container includes the cost of the soil that fills the container. To calculate this,

① Find the volume of each container. The cell pack cell and the square pot are considered boxes. Volume for each of these is easy to calculate.

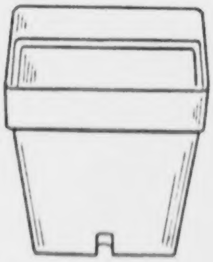
Cell Pack (Figure 7-2)

Figure 7-2



- measurements of 1 cell - 2 ⅜" by 1 ¾" by 1 ⅞"
- volume of 1 cell = 2.375 x 1.75 x 1.875 = 7.79 cu in.
- volume of 4 cells (cell pack) = 7.79 x 4 = 31.16 cu in.

Figure 7-3



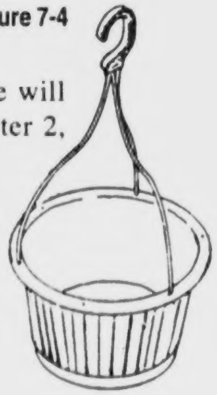
Square Pot (Figure 7-3)

- measurements of 4" square pot - 4" by 4" by 3 ⅞"
- volume of 4" pot = 4 x 4 x 3.875 = 62 cu in.

Hanging Basket (Figure 7-4)

Hanging baskets are irregular in shape. Calculating their volume will be a good guess at best. Of the three shapes we studied in Chapter 2, the shape of a hanging basket most closely resembles a cylinder. So we will calculate the volume of a basket by calculating the volume of a cylinder that has the same diameter and height as the basket. Keep in mind that the answer is only a good estimate.

Figure 7-4



- measurements of basket - 10" in diameter and 5 ¼" deep
- volume of the basket (as a cylinder) =
  3.14 x 5 x 5 x 5.25 = 412.13 cu in.

Media

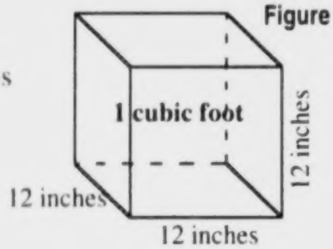
② You need to know how many containers one bag of soil will fill.

Example 4 (See Invoice 2)

Wonder-gro soil purchased for a project is sold in bags containing 5.5 cubic feet of compressed soil. This soil fluffs to 10 cubic feet of soil.

Convert cubic feet to cubic inches because container volume measurements are expressed in cubic inches (Figure 7-5).

Figure 7-5



- volume of one cubic foot = 12" x 12" x 12"
  volume of one cubic foot = 1728 cubic inches

$$\frac{1 \text{ cu ft}}{1728 \text{ cu in.}} = \frac{10 \text{ cu ft}}{?}$$

$$? = 17{,}280 \text{ cu in.}$$

③ To determine the cost, divide the unit price of one bag by the number of containers filled by one bag of soil.

- number of containers = 17,280 cu in. ÷ cu in. of soil in one container
- cost of soil in one container = cost of one bag ÷ number of containers filled by one bag

Cost of soil in one cell pack

17,280 ÷ 31.16 = 554.5 = 554 containers

$22.95 ÷ 554 = $.04 per cell pack

Cost of soil in a 4" square pot

17,280 ÷ 62 = 278.7 *or* 278 containers

$22.95 ÷ 278 = $.08 per 4" pot

Cost of soil in a hanging basket

17,280 ÷ 412.13 = 41.9 *or* 41 containers

$22.95 ÷ 41 = $.56 per basket

Chemicals

Chemicals are widely used in the horticulture industry to control insect pests and diseases and to retard plant growth. They can be very effective when used properly. On geranium crops, for example, a growth retardant is commonly used to produce compact, well-branched plants. This can be quite costly. One gallon of a growth retardant may cost $250. A single application of 1.5 teaspoons of the retardant, however, is effective for use on approximately 5000 plants.

Example 5

COMPACTALL

Let's say you decide to treat the geranium crop and the geranium baskets with a growth retardant called Compactall. You will need to mix 1.5 teaspoons of the chemical with one-half gallon of water for a single application. Three applications will probably be necessary in the following amounts:

application #1:	1 gallon of mixture including	3 tsp Compactall
application #2:	3 gallons of mixture including	9 tsp Compactall
application #3:	4 gallons of mixture including	12 tsp Compactall
	total amount of Compactall used	24 tsp

A gallon container of Compactall costs $250. What will be the cost for 24 teaspoons of Compactall?

- First, convert 1 gallon to equivalent teaspoons.

1 gallon = 8 pints = 16 cups

1 cup = 16 tablespoons = 48 teaspoons

$$\frac{1 \text{ cup}}{48 \text{ tsp}} = \frac{1 \text{ gal}}{?}$$

$$\frac{1 \text{ cup}}{48 \text{ tsp}} = \frac{16 \text{ cups}}{?}$$

$$\frac{16 \text{ cups} \times 48 \text{ tsp}}{1 \text{ cup}} = 768 \text{ tsp}$$

- Second, using a proportion again, find the cost of the 24 teaspoons of Compactall.

$$\frac{768 \text{ tsp}}{\$250} = \frac{24 \text{ tsp}}{?}$$

$$\frac{\$250 \times 24 \text{ tsp}}{768 \text{ tsp}} = \$7.81$$

- Compactall cost per plant = cost of chemical used ÷ number of plants treated

Compactall cost per plant = $7.81 ÷ 5100
= $.0015 *or* $.01

Example 6

GREEN-GLO Fertilizer

Green-Glo is a granular fertilizer that is applied to a crop to promote healthy plants and optimum growth. This fertilizer is mixed with water in the ratio of 3 cups of Green-Glo to 5 gallons of water. The 5-gallon solution will treat approximately 2000 plants.

How much will it cost to use this product on your bedding plant crop? To calculate this, you must know approximately how many plants will be produced and how many applications of the product this crop will need. Now, it is always difficult to determine accurately the number of plants that will be grown. Factors like poor germination and loss of plants will affect the size of your crop. In this example, the estimate of the size of the crop will be based on the total number of plants on the purchase order, rounded to the nearest 10,000 - Form A (page 241). This number will not be 100% correct, but it is a "good guess" for the number of plants you will produce.

The plan is to fertilize once every two weeks as soon as the plants have been transplanted from germination flats. Two weeks are first allowed for germination and transplanting. For example, a marigold crop needs 10 weeks' growing time till it is ready for market. The crop will be fertilized for 8 weeks, or 4 times. Table 7-1 summarizes the plan for fertilization.

Table 7-1 **Chart for Application of Fertilizer**

Weeks to market	Plant name	Number of times	Batches per application	Total
16	geranium fuchsia begonia ivy geranium	7	3.5	24.5
14	alyssum dusty miller snapdragon vinca	6	17	102
11	ageratum petunia	4	7	28
10	impatiens marigold salvia	4	10	40
9	coleus	3	3	9
8	aster celosia pepper	3	7	21
6	broccoli cabbage onion	2	10	20
5	tomato	1	2	2
		Total number of applications		246.5 *or* **247**

What is the cost of mixing one application of Green-Glo? One application uses 3 cups of the product. A 25-pound bag of Green-Glo sells for $22.95 and contains 50 cups of the product.

$$\frac{25\text{ lb}}{\$22.95} = \frac{50\text{ cups}}{\$22.95} = \frac{3\text{ cups}}{?} \qquad \frac{\$22.95 \times 3}{50} = \$1.38$$

The cost of mixing 247 applications is $340.86 (247 x $1.38).

✿ cost of fertilizer per plant = cost of all applications ÷ number of plants being treated

cost of fertilizer per plant = \$340.86 ÷ 120,000

= \$.0028 *or* \$.01

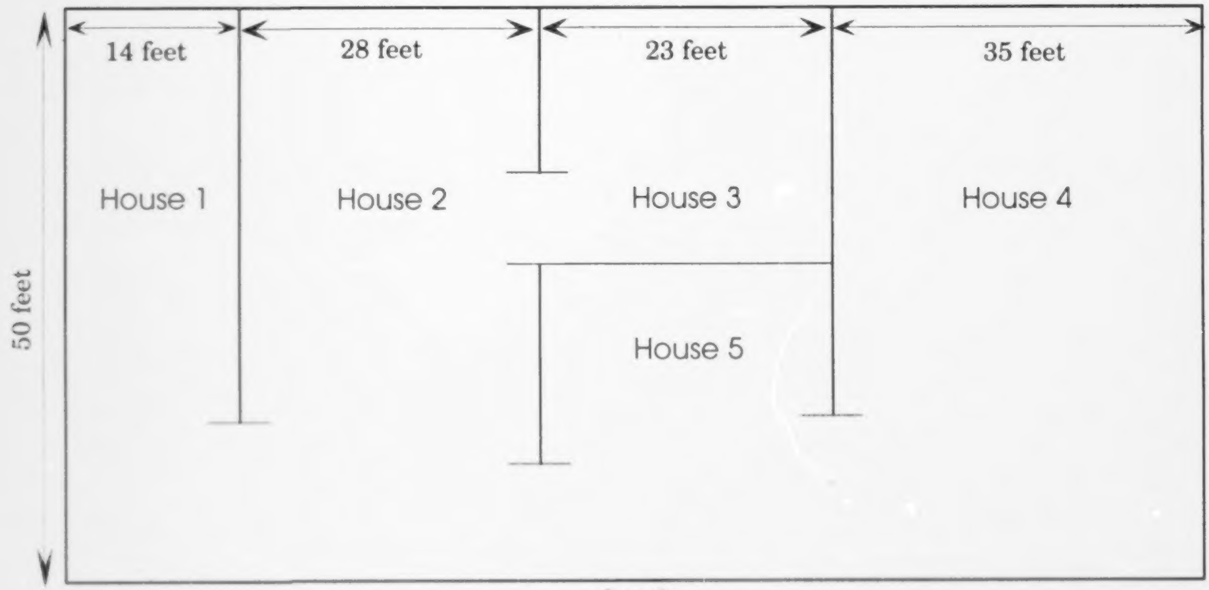
Overhead

Overhead includes all those business expenses that cannot be charged to a particular part of the business or a particular job. But they do affect the cost of crop production and the profit to be made. Examples of overhead costs are heat, water, electricity, and insurance. The following formula is helpful to use to calculate overhead costs for a crop of bedding plants.

$$\boxed{\text{overhead per plant} = \frac{\text{days in greenhouse} \times \text{square footage in greenhouse} \times .02}{\text{total number of plants being produced}}}$$

Take for an example a floor plan such as Figure 7-6 for a greenhouse range that will be used to produce a bedding plant crop. The area of this greenhouse complex is 5000 square feet.

Figure 7-6



The number of days needed to produce this crop ranges from 35 days (5 weeks) to 112 days (16 weeks). To find the overhead costs involved in 112-day production, use the preceding formula and make these calculations:

$$\text{overhead for each of the 112-day plants} = \frac{112 \text{ days} \times 5000 \text{ sq ft} \times .02}{120{,}000 \text{ plants}}$$

$$= \$.093 \textit{ or } \$.09$$

The overhead for each plant would be $.09.

Labor

Labor is one of the most costly factors of crop production. The manager of a business must consider the cost of providing wages and benefits to workers when setting the selling price of the crop. The labor that students provide to produce a crop is typically free. It is, therefore, not a cost factor we will consider in determining the price of this crop. Keep in mind, however, that this is a unique situation. Out in the "real" business world, labor costs are very important.

Putting It All Together

The following cost factors have been considered and calculated in this chapter: seed or cuttings, containers, soil, fertilizer, growth regulator, and overhead. The total cost of producing a **single plant** of the crop is found by putting all this information together.

Example 1

Cost of producing **one** red orbit geranium

seed or cutting	$0.08
container	.06
soil	.08
fertilizer	.01
Compactall	.01
overhead	.09
total production cost	$ .33

The cell packs used for the crop hold four plants. To determine the cost of the cell pack, you would multiply the total production cost for one plant by 4.

Example 2

Cost of producing a **cell pack** of the marigold 'Bolero'

seed or cutting	$0.01 x 4 =	$.04
container		.02
soil		.04
fertilizer	.01 x 4 =	.04
Compactall		0
overhead	.06 x 4 =	.24
total production cost		$ .38

The **hanging baskets** used for the crop each hold four plants. As with cell packs, total production cost for one plant must be multiplied by 4 to determine the cost of the basket.

Example 3

Cost of producing a **basket** of red fuchsia

seed or cutting	$0.27 x 4 =	$1.08
container		.74
soil		.56
fertilizer	.01 x 4 =	.04
Compactall		0
overhead	.09 x 4 =	.36
total production cost		$2.78

Selling Price

In the horticulture industry, after you have determined the costs involved in producing a crop, you can determine the selling price by using either a percent mark-up (like 40%) or a ratio mark-up (like 3:1). You must take into consideration such factors as competition in the area and what price buyers are willing to pay. Then you can set the rates that determine the selling price of each crop.

Chapter 7, Practice Set 1

Class Project

Items you will need:

✓ Assigned plant names from your instructor from Invoice 1 or 3 (pages 224-225)
✓ Form A (page 241)
✓ A seed catalog

1. Find the cost of one seed or one cutting for each of the varieties you were assigned. Use Form A.

2. Share your results with others in the class so that everyone compiles a list of the cost of the seeds and cuttings for the crop production.

Chapter 7, Practice Set 2

Items you will need:

✓ Form B (page 242)
✓ A seed catalog
✓ A calendar

★ Determine which month and which week in that month is the right time to sow each variety of seed so that the plants are ready for sale on May 1.

Chapter 7, Practice Set 3

Container Costs

Find the cost of each container being used for the crop production. Use the invoices on pages 224-225 and the information from the manufacturers on page 226.

Type of Container	Cost per Case	Units in Case	Unit Cost

Chapter 7, Practice Set 4

Find the answer for each of these situations. Round your answer to the nearest pot or cent.

1. One bag of Supergro planting soil contains 8 cubic feet of soil after the soil has been fluffed. How many 3.5" square pots can be filled with one bag of Supergro if the pots are 3" deep? ______

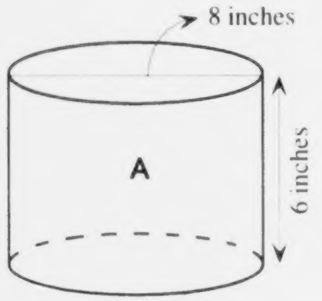
2. Plastic hanging baskets are sold 80 pots to a case. What is the cost of a single basket if eight cases cost $496? ______

3. A bag of Better Crop planting soil contains 5 cubic feet of soil after the soil is fluffed. How many 6" round pots can be filled with one bag of this soil if the pots are 8" deep? ______

4. Five-inch-round pots are sold 500 pots to a case. Find the cost of a single pot if 10 cases cost $632. ______

5. A bag of Premium Crop soil contains 12 cubic feet of soil after the soil is fluffed. This bag sells for $24.95. What is the cost of the amount of this soil that fills a 4" round pot 3.5" deep? ______

6. If you used the Premium Crop soil from question 5 to fill container **A**, how much would it cost? ______



Chapter 7, Practice Set 5

Make the following calculations and fill in the blanks.

1. Find the cost **per plant** of treating a crop of 180 geranium plants with Compactall if the following applications are used: 2 gallons of solution, 5 gallons of solution, and 7 gallons of solution. Mixing rate is 1.5 teaspoons per half gallon of water. One gallon of Compactall costs $250. ________________

2. Find the cost **per plant** of treating a crop of 7,500 mum plants with Compactall if the following applications are used: 3 gallons of solution, 7 gallons of solution, and 12 gallons of solution. Mixing rate is 2 teaspoons per half gallon of water. One gallon of Compactall costs $198. ________________

Chapter 7, Practice Set 6

Make the following calculations and fill in the blanks.

1. The fertilizer Green-Glo is sold in 25-pound bags that cost $25.00 each. Four cups of this product are mixed with 5 gallons of water for one application. The plants to be fertilized will require 10 applications. Find the per-plant cost for fertilizing 5000 plants. ________________

2. Go-Green fertilizer is sold in 20-pound bags that cost $24.00 each. Three cups of this product are mixed with 5 gallons of water per application. The plants you are fertilizing will require 25 applications. Find the per-plant cost for fertilizing 2500 plants. ________________

Overhead Costs

Calculate the overhead cost for the crop production in the space provided in the table. Assume the greenhouse has 5000 square feet of growing space and that a total of 120,000 plants are being produced.

Weeks to market	Overhead Cost per Plant
14	
11	
10	
9	
8	
6	
5	

Chapter 7, Practice Set 8

COST FACTORS

Ⓐ Find the cost of producing a begonia basket and an ivy geranium basket if each contains four plants. List cost factors for each; then determine the total cost of production.

COST FACTORS	Begonia Basket	Ivy Geranium Basket
TOTAL COST		

Ⓑ Find the cost of producing each of the plants you were assigned in Practice Set 1. Fill in the plant name and list the cost factors for each; then determine the total cost of production. (For more than three plants, fill in page 239, too.)

COST FACTORS	PLANT NAMES		
	1	2	3
TOTAL COST			

(continued)

Ⓑ **Cost factors** *(continued)*

COST FACTORS	PLANT NAMES		
	4	5	6
TOTAL COST			

COST FACTORS	PLANT NAMES		
	7	8	9
TOTAL COST			

Possible Selling Prices

(A) List in the first column all the plants you were assigned in Practice Set 1. Find the selling price for each mark-up rate.

Plant Name	Total Cost Production	Selling Price if Mark-up is:						
		30%	2:1	40%	3:1	45%	4:1	60%
	$							

(B) Find the selling price for a hanging basket of each of the plants listed at each of the mark-up rates given.

Plant Name	Total Cost Production	Selling Price if Mark-up is:				
		40%	2:1	65%	3.5:1	75%
Ivy geranium	$					
Begonia						
Fuchsia						

Form A Seed and Cutting Costs

Plant Name	Seeds per oz	Amount purchased	Number of seeds in purchase	Cost of all seeds	Cost per seed

Form B Planting Schedule for Spring Crop

Date	Plant Name
December week 1	
week 2	
week 3	
week 4	
January week 1	
week 2	
week 3	
week 4	
February week 1	
week 2	
week 3	
week 4	
March week 1	
week 2	
week 3	
week 4	
April week 1	
week 2	
week 3	
week 4	

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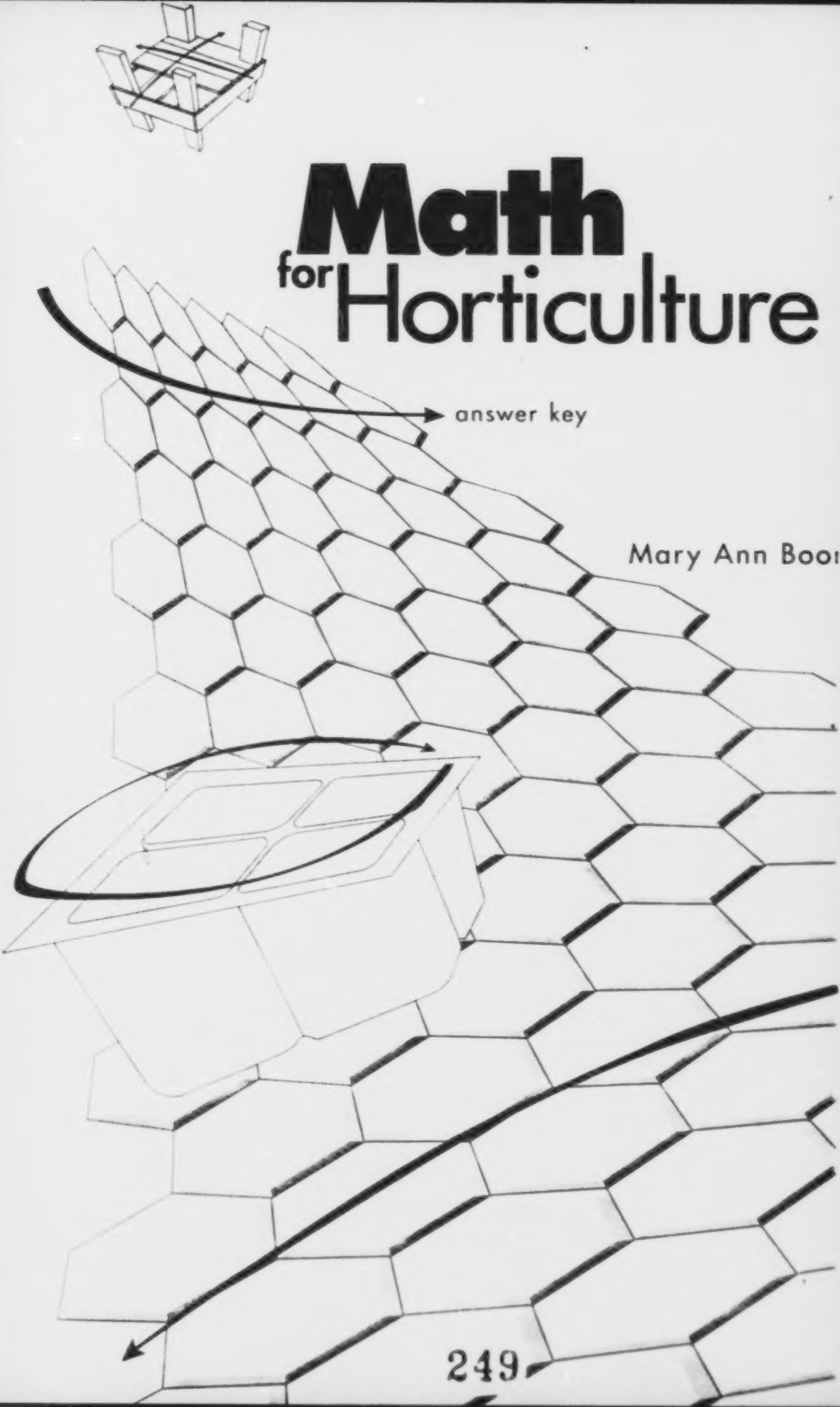
Math
for Horticulture

answer key



Mary Ann Boo

Math
for
Horticulture

Answer Key

Mary Ann Boor

Ohio Agricultural Education
Curriculum Materials Service
The Ohio State University

This *Answer Key* is a supplement to *Math for Horticulture*, the student manual written by Mary Ann Boor for use with horticulture, nursery and landscape students. This Key supplies the answers for the Practice Sets found at the end of every chapter. The chapter numbers are easy to locate in the upper right corner of the odd pages.

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Chapter 6 41
Chapter 7 46

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Columbus, Ohio 43210-1067

1994

CHAPTER 1

Practice Set 1
page 12

B	8	4 ½ in.
	9	½ in.
	10	2 in.
	11	1 ½ in.
	12	2 ½ in.
	13	3 ½ in.
	14	3 in.
	15	1 in.
	16	5 ½ in.
	17	4 in.
	18	5 in.
	19	2 ½ in.
	20	½ in.

Practice Set 2
pages 13-14

B	17	¼ in.
	18	3 ⅜ in.
	19	5 ¾ in.
	20	2 ½ in.
	21	1 ⅜ in.
	22	1 ⅝ in.
	23	2 ⅛ in.
	24	5 ⅜ in.
	25	4 ¼ in.
	26	3 ½ in.
	27	5 ⅛ in.
	28	⅜ in.
	29	3 ⅛ in.
	30	⅞ in.
	31	1 ⅝ in.
	32	1 ⅞ in.

Practice Set 3
page 15

A	1	⅞ in.
	2	5 9⁄16 in.
	3	2 9⁄16 in.
	4	1 7⁄16 in.
	5	5 ¼ in.
	6	2 1⁄16 in.
	7	3⁄16 in.
	8	3 5⁄16 in.
	9	15⁄16 in.
	10	2 11⁄16 in.

Practice Set 4 *page 16*

1	1 11⁄16 in.
2	1 in.
3	3 ⅞ in.
4	2 9⁄16 in.
5	3 ½ in.
6	⅜ in.
7	1 9⁄16 in.
8	2 ⅛ in.
9	4 ⅞ in.
10	13⁄16 in.
11	2 ⅞ in.
12	1 5⁄16 in.
13	3 ¼ in.
14	4 7⁄16 in.
15	2 ⅜ in.
16	1 ½ in.
17	4 ⅛ in.
18	1 ¾ in.
19	5⁄16 in.
20	3⁄16 in.
21	2 3⁄16 in.
22	2 ⅝ in.
23	3 13⁄16 in.
24	3 ⅞ in.
25	2 15⁄16 in.

Practice Set 5 *page 17*

1	15 ft	18	540 in.	35	90 in.
2	21 ft	19	828 in.	36	576 in.
3	39 ft	20	648 in.	37	96 ft.
4	30 ft	21	72 in.	38	120 ft.
5	216 ft	22	96 in.	39	1044 in.
6	24 ft	23	60 in.	40	198 in.
7	36 ft	24	120 in.	41	27 in.
8	45 ft	25	78 in.	42	18 in.
9	69 ft	26	144 in.	43	9 in.
10	54 ft	27	24 in.	44	3 in.
11	180 in.	28	84 in.	45	6 in.
12	252 in.	29	108 in.	46	9 in.
13	468 in.	30	240 in.	47	63 in.
14	360 in.	31	48 ft.	48	30 in.
15	972 in.	32	252 in.	49	117 in.
16	288 in.	33	450 in.	50	12 in.
17	432 in.	34	228 in.		

Practice Set 6 *page 18*

1	168 ft	11	6 yd	21	2 yd
2	21 ft	12	432 in.	22	5 yd
3	9 yd	13	14 yd	23	7 yd
4	12 yd	14	7 yd	24	3 yd
5	1368 in.	15	20 yd	25	11 yd
6	75 ft	16	3 ft	26	3.5 yd
7	45 yd	17	8 ft	27	165 in.
8	576 in.	18	6 ft	28	13.5 ft
9	120 ft	19	4 ft	29	31.5 ft
10	14 yd	20	10 ft	30	189 in.

Practice Set 6 *page 18 (continued)*

31 0.5 ft
32 1.5 ft
33 42 in.
34 45 in.
35 3.5 ft
36 1.5 yd
37 7.5 ft
38 5.5 yd
39 219 in.
40 99 in.
41 27 in.
42 18 in.
43 9 in.
44 3 in.
45 6 in.
46 9 in.
47 45 in.
48 30 in.
49 135 in.
50 9 in.

Practice Set 7 *page 19*

ACROSS

1 2 ft
2 84 in.
4 36 in.
6 21 ft
7 684 in.
8 15 ft
9 360 in.
10 8 ft
11 198 ft
12 5 ft
13 236 yd
14 60 ft
15 710 ft
16 48 ft
17 30 ft
18 25 yd
19 1 yd

DOWN

1 2 yd
2 81 in.
3 4 ft
4 380 in.
5 64 in.
6 25 in.
7 668 in.
8 18 in.
9 396 in.
11 130 in.
12 50 in.
13 210 in.
14 68 in.
15 73 in.
16 45 in.
18 2 ft
19 1 yd

4 MATH for HORTICULTURE

Practice Set 8 *page 20*

A 1 16 qt
2 8 qt
3 24 qt
4 10 qt
5 7 qt

B 1 4 gal
2 5 gal
3 8 gal
4 5.5 gal
5 10.5 gal

C 1 32 pt
2 16 pt
3 48 pt
4 20 pt
5 14 pt

D 1 2 gal
2 3 gal
3 4 gal
4 5 gal
5 5.25 gal

E 1 512 oz
2 256 oz
3 768 oz
4 320 oz
5 224 oz

F 1 2 gal
2 5 gal
3 1 gal
4 3 gal
5 4 gal

G 1 96 oz
2 160 oz
3 64 oz
4 256 oz
5 384 oz

H 1 2 qt
2 4 qt
3 1 qt
4 8 qt
5 3 qt

Practice Set 9 *page 21*

A 1 6 pt
2 10 pt
3 4 pt
4 16 pt
5 24 pt

B 1 32 qt
2 64 qt
3 16 qt
4 128 qt
5 48 qt

C 1 80 oz
2 48 oz
3 96 oz
4 64 oz
5 16 oz

D 1 5 pt
2 2 pt
3 1 pt
4 6 pt
5 3 pt

E 1 24 qt
2 4 qt
3 80 oz
4 2 qt
5 2 pt

F 1 64 pt
2 4 gal
3 32 pt
4 64 oz
5 32 pt

G 1 16 qt
2 384 oz
3 64 oz
4 128 oz
5 64 oz

H 1 16 pt
2 4 qt
3 6 pt
4 2 pt
5 384 oz

6 MATH for HORTICULTURE

Practice Set 10 *page 22*

A	
1	22 ft
2	60 in.
3	2 gal
4	3 pt
5	70 in.
6	6 gal
7	128 oz
8	10 ft
9	60 ft
10	13 qt

B	
1	150 ft
2	9 yd
3	⅔ or .67 yd
4	270 in.
5	2880 in.

C **1** 6 in. = ½ or .5 ft
30 in. = 2.5 ft
2 yd = 6 ft

2 2.5 yd = 90 in.
1.75 yd = 63 in.
3 yd = 108 in.

Practice Set 11
page 23

1	2 qt
2	186 oz
3	17 pt
4	6 qt
5	540 oz
6	36 ft
7	2 ft
8	63 in.
9	3 ft
10	0 in.
11	8 oz
12	1 pt
13	480 oz or 15 qt
14	38.5 qt
15	21 pt

Practice Set 12
page 24

1	$13.33
2	$13.27
3	$2.89
4	$86.53
5	$11.25
6	$20.42
7	$31.50
8	$8.10
9	$17.24
10	$3.47
11	$5.00
12	$64.58

Practice Set 13
page 25

1	$104.53
2	$13.32
3	$2.97
4	$94.72
5	$7.50
6	$14.35
7	$47.25
8	$8.10
9	$20.68
10	$3.47
11	$87.16
12	$36.99
13	$12.50
14	$50.00

Practice Set 14

page 26

B	11	6 cm
	12	10 cm
	13	4 cm
	14	14 cm
	15	2 cm
	16	8 cm
	17	12 cm
	18	1 cm
	19	13 cm
	20	9 cm
	21	7 cm
	22	11 cm
	23	5 cm

Practice Set 15

page 27

A	1	58 mm
	2	72 mm
	3	85 mm
	4	107 mm
	5	42 mm

Practice Set 16

page 28

A	1	0.5 dm
	2	1.2 dm
	3	0.8 dm
	4	0.2 dm
	5	1.4 dm
	6	0.4 dm
	7	1.3 dm
	8	0.9 dm
	9	1.1 dm
	10	0.1 dm

Practice Set 17 *page 29*

ACROSS

1	1 m
2	60 cm
4	55 dm
6	10 dm
7	650 cm
8	12 m
9	620 cm
10	8 dm
11	750 cm
13	625 cm
14	50 dm
15	875 cm
16	15 dm
17	80 dm
18	32 cm
19	1 m

DOWN

2	60 dm
4	550 mm
5	50 cm
6	12 m
7	620 cm
8	18 dm
9	655 cm
11	725 mm
12	60 cm
13	670 mm
14	55 cm
15	88 cm
16	12 dm

Practice Set 18 *page 30*

A 1 20 dm
2 50 dm
3 70 dm
4 30 dm
5 170 dm

B 1 5 m
2 8 m
3 4 m
4 2 m
5 15 m

C 1 600 cm
2 400 cm
3 800 cm
4 1200 cm
5 900 cm

D 1 7 m
2 3 m
3 5 m
4 1 m
5 12 m

E 1 5000 mm
2 2000 mm
3 7000 mm
4 3000 mm
5 17,000 mm

F 1 8 m
2 5 m
3 4 m
4 2 m
5 1.5 m

G 1 100 cm
2 200 cm
3 300 cm
4 400 cm
5 800 cm

H 1 5000 mm
2 2000 mm
3 3000 mm
4 1000 mm
5 7000 mm

I 1 450 cm
2 300 cm
3 250 cm
4 600 cm
5 800 cm

J 1 40 dm
2 65 dm
3 30 dm
4 25 dm
5 50 dm

Practice Set 19 *page 31*

A 1 200 cm
2 5000 mm
3 170 dm
4 3000 mm
5 270 dm

B 1 5000 mm
2 800 cm
3 0.4 m
4 2000 mm
5 1.5 m

C 1 6000 mm
2 1400 cm
3 2800 cm
4 220 dm
5 9000 cm

D 1 70 dm
2 0.3 m
3 500 mm
4 1 m
5 1.2 m

E 1 50,000 mm
2 22,000 mm
3 7500 cm
4 370 dm
5 1700 cm

F 1 0.8 m
2 5000 cm
3 4.5 m
4 2.1 dm
5 15 cm

G 1 1000 cm
2 2.5 m
3 300 cm
4 400 mm
5 8 cm

H 1 5 m
2 2500 mm
3 32.5 dm
4 10 dm
5 700 mm

I 1 45,000 cm
2 3 cm
3 2.5 dm
4 6.4 m
5 800 cm

J 1 4000 dm
2 6.5 m
3 3000 mm
4 2.5 m
5 50,000 mm

Practice Set 20 *page 32*

A 1 30 dl
2 40 dl
3 80 dl
4 90 dl
5 270 dl

B 1 5 l
2 6 l
3 4 l
4 3 l
5 25 l

C 1 500 cl
2 400 cl
3 1100 cl
4 1200 cl
5 900 cl

D 1 7 l
2 6.5 l
3 6 l
4 1 l
5 12 l

E 1 5000 ml
2 2000 ml
3 7000 ml
4 3000 ml
5 19,000 ml

F 1 8 l
2 6 l
3 4 l
4 2 l
5 4.5 l

G 1 100 cl
2 200 cl
3 600 cl
4 400 cl
5 800 cl

H 1 6000 ml
2 9000 ml
3 3000 ml
4 1000 ml
5 7500 ml

I 1 450 cl
2 300 cl
3 250 cl
4 680 cl
5 850 cl

J 1 40 dl
2 65 dl
3 30 dl
4 25 dl
5 50 dl

Practice Set 21 *page 33*

A 1 700 cl
2 5000 ml
3 370 dl
4 3000 ml
5 250 dl

B 1 5000 ml
2 800 cl
3 4.5 l
4 3200 ml
5 1.5 l

C 1 5000 ml
2 2400 cl
3 3000 cl
4 220 dl
5 4900 cl

D 1 60 dl
2 0.35 l
3 5000 ml
4 1 l
5 1.2 l

E 1 50,000 ml
2 30,000 ml
3 7500 cl
4 290 dl
5 4700 cl

F 1 0.8 l
2 5000 cl
3 4 l
4 25 dl
5 20 cl

G 1 1000 cl
2 3 l
3 3500 cl
4 400 ml
5 8 cl

H 1 5.5 l
2 2000 ml
3 35 dl
4 10 dl
5 750 ml

I 1 40,000 cl
2 3 cl
3 5.5 dl
4 5.6 l
5 850 cl

J 1 3500 dl
2 6.5 l
3 2000 ml
4 7.5 l
5 30,000 ml

Practice Set 22 *page 34*

A 1 7000 cc
2 5000 cc
3 37,000 cc
4 3000 cc
5 25,000 cc

B 1 5000 cc
2 8000 cc
3 4500 cc
4 3200 cc
5 1500 cc

C 1 120 ml
2 1200 ml
3 150 cl
4 27 cl
5 20 dl

D 1 0.5 l
2 7.5 dl
3 900 cl
4 675 ml
5 8.5 l

E 1 5 m
2 7 m
3 62 dm
4 8 m
5 5500 mm

F 1 5 l
2 23 ml
3 1250 ml
4 2 l
5 2 l
6 560 ml
7 8500 ml

G 1 2 cc
2 45 cm
3 15 l
4 35 cc
5 2 cl

H 1 12 l
2 5 dl
3 12 l
4 150 dl
5 710 cm
6 7 l
7 22 m

CHAPTER 2

Practice Set 1 *pages 49-50*

1	12 ft	11	19.2 in.
2	18 in.	12	30.14 in.
3	91 ft	13	160 ft
4	142 in.	14	35.4 in.
5	31.4 in.	15	46 ft
6	18.4 ft	16	12 ft
7	210 in.	17	18.84 ft
8	45 in.	18	10.8 in.
9	30 ft	19	42 ft
10	24 ft		

Practice Set 2 *pages 51-52*

1	180 ft	6	88 ft
2	238 ft	7	66.55 ft
3	240 ft	8	56 ft
4	30.14 in.	9	78 in.
5	146 ft	10	70 in.

Practice Set 3 *pages 53-54*

1	880 sq in.	9	52.78 sq ft
2	1271 sq ft	10	28.26 sq in.
3	139.5 sq in.	11	82.81 sq ft
4	693 sq ft	12	8.4 sq in.
5	1504 sq in.	13	200.96 sq in.
6	324 sq ft	14	0.5024 sq in.
7	340.6 sq ft	15	2400 sq ft
8	32.49 sq yd	16	314 sq ft

Practice Set 4 *pages 55-57*

	PERIMETER	AREA
1	33 in.	49.5 sq in.
2	72 ft	276 sq ft
3	197 in.	1872 sq in.
4	74 ft	187 sq ft
5	26 ft	42.25 sq ft
6	158 in.	1504 sq in.
7	32.66 ft	84.91 sq ft
8	52 in.	169 sq in.
9	163 ft	1260 sq ft
10	76 in.	286 sq in.
11	47.1 in.	176.63 sq in.
12	86 in.	406 sq in.
13	137 ft	787.5 sq ft
14	37.68 in.	113.04 sq in.
15	17.6 ft	12 sq ft
16	171 ft	1029.5 sq ft
17	65.31 ft	339.62 sq ft
18	3.6 ft	0.81 sq ft
19	54 ft	180 sq ft
20	120 in.	700 sq in.

Practice Set 5 *pages 58-59*

1	5.35 yd
2	60.8 ft
3	153.6 sq ft
4	3215.36 sq in.
5	24 ft
6	39.0625 sq ft
7	3.2 sq yd
8	7.85 ft
9	17.25 sq ft
10	23.2 yd
11	110 ft
12	180 ft
13	90 ft
14	220 ft

Practice Set 6 *pages 60-61*

1	27.56 sq ft
2	21 ft
3	25.12 ft
4	60 sq ft
5	46 ft
6	78.5 sq ft
7	312.5 sq ft
8	65.4 ft
9	162.8 ft
10	314 sq ft
11	500 sq ft
12	73.8 ft
13	340 ft
14	172 ft
15	1500 sq ft
16	3000 sq ft
17	6180 sq ft

Practice Set 7 *pages 62-63*

1	1200 cu in.
2	392.5 cu in.
3	2712.96 cu in.
4	1017.36 cu in.
5	512 cu in.
6	6048 cu in.
7	5652 cu in.
8	48 cu in.
9	1071.79 cu in.
10	2250 cu in.
11	261.67 cu in.
12	4160 cu in.
13	11,488.21 cu in.
14	5572.45 cu in.
15	5652 cu in.

Practice Set 8 *page 64*

1	155.09 or 154.7 cu ft
2	144.16 cu ft
3	85.97 cu ft
4	990 cu ft
5	143.72 or 143.36 cu ft
6	901.71 cu ft
7	183.125 cu ft
8	172.5 cu ft
9	97.67 or 97.42 cu ft
10	810 cu ft
11	38.77 or 38.68 cu ft
12	567.16 cu ft

Practice Set 9 *pages 65-66*

	CUBIC INCHES	CUBIC FEET
1	1440 cu in.	0.833 cu ft
2	1099 cu in.	0.636 cu ft
3	463,011.83 or 461,854.31 cu in.	267.95 or 267.28 cu ft
4	1071.79 or 1069.1 cu in.	0.62 or 0.63 cu ft
5	33,233.76 cu in.	19.23 cu ft
6	6480 cu in.	3.75 cu ft
7	33,761.28 cu in.	19.54 or 19.43 cu ft
8	14,040 cu in.	8.13 cu ft
9	3704.1 or 3694.8 cu in.	2.14 cu ft
10	24,416.6 or 24,355.6 cu in.	14.1 cu ft
11	41,203.1 or 41,100 cu in.	23.8 cu ft
12	40,270.5 cu in.	23.31 cu ft

Practice Set 10 *page 67*

1 324 cu in. or 0.188 cu ft
2 11,664 cu in. or 6.75 cu ft
3 one bag (10 cu ft = 17,280 cu in.)
4 117.75 cu ft
5 1728 cu in. or 1 cu ft
6 50 cu ft
7 173.6 cu ft
8 24 bags
9 34 bags

CHAPTER 3

Practice Set 1 *page 91*

	JONES		WHITE		
a	$26.00	a	$10.00	f	17.00
b	12.50	b	15.00	g	61.25
c	53.90	c	5.00	h	3.06
d	45.00	d	9.00	i	64.31
e	137.40	e	5.25		
f	7.90				
g	145.30				

Practice Set 2 *page 92*

	HAYNES		SAKAMOTO
a	$ 21.00	a	$ 3.25
b	7.50	b	5.25
c	10.50	c	3.00
d	7.50	d	18.50
e	12.95	e	9.25
f	6.50	f	39.25
g	65.95	g	1.96
h	3.96	h	41.21
i	69.91		

Practice Set 3 *page 93*

	INVOICE 8404		INVOICE 8405
a	OK	a	OK
b	should be $34.50	b	OK
c	OK	c	should be $159.00
d	OK	d	OK
e	should be $219.63	e	OK
✓	incorrect	f	OK
		g	should be $1293.20
		✓	incorrect

Practice Set 4 *page 94*

1 Brown
7 roses = $14.58 or 14.56
5 mums = 12.50
subtotal = 27.08 or 27.06
sales tax = 1.35
total = $28.43 or 28.41

2 Simpson
3 red carnations = $2.25
4 white carnations = 3.00
impatiens basket = 9.95
subtotal = 15.20
sales tax = .91
total = $16.11

3 Burns
3 roses = $10.00 or 9.99
5 daisies = 2.50
gift box = 1.50
subtotal = 14.00 or 13.99
sales tax = .84
total = $14.84 or 14.83

4 Jones
2 mum plants = $5.96
6 bulbs = 11.96
3 bulbs = 1.25 or 1.26
subtotal = 19.17 or 19.18
sales tax = 1.05
total = $20.22 or 20.23

5 Phillips
2 bags mulch = $6.67 or 6.66
16 ft edging = 31.89 or 31.84
3 bags fertilizer = 23.94
subtotal = 62.50 or 62.44
sales tax = 3.91 or 3.90
total = $66.41 or 66.34

6 Smith
3 mum plants = $17.94
5 yd ribbon = 11.85
2 decorations = 15.00
subtotal = 44.79
sales tax = 2.69
total = $47.48

7 Monroe
1/2 doz. roses = $17.50
1/2 doz. carnations = 8.75
gift box = 1.50
subtotal = 27.75
sales tax = 1.67
total = $29.42

8 Snipes
5 carnation bouquets = $29.90
5 carnation corsages = 14.90
rose bouquet = 25.00
subtotal = 69.80
sales tax = 4.54
total = $74.34

Practice Set 5 *pages 95-97*

1 Lynn Cooke

Currency	$62.00
Coins	0
Checks	32.00
Subtotal	94.00
Less cash received	0
Total deposit	$94.00

2 Marc Barnes

Currency	0
Coins	$ 1.48
Checks	149.55
	72.75
Subtotal	223.78
Less cash received	50.00
Total deposit	$173.78

3 Sarah Jones

Currency	0
Coins	$ 1.01
Checks	215.60
Subtotal	216.61
Less cash received	38.00
Total deposit	$178.61

4 Juan Garcia

Currency	$430.00
Coins	5.89
Checks	96.75
	27.22
Subtotal	559.86
Less cash received	0
Total deposit	$559.86

5 no; seventy-eight and $^{95}/_{100}$

6 June bill

7 no; one hundred thirty-seven and 52/100

8 507

9 house payment

10 signature

11 pay to order:
Arizona Electric Co.
forty-three and 11/100
July bill

12
a 309.71
b 309.71
c 138.63
d 122.74

13
a 49.02
b 576.84
c 534.76
d 496.61

14
a OK
b OK
c OK
d should be 603.68
e amount of check in wrong column; should be subtracted from **d**, to be 517.36

Practice Set 6 *page 98*

check register balance after subtracting service charge: $723.51
checks outstanding: 60.00, 23.19; total 83.19
bank balance shown: 556.70
add deposits: 250.00
total: 806.70
balance: $723.51

Practice Set 7 *page 99*

checks outstanding: $299.00, 19.00, 52.45, 299.00
total checks outstanding: 669.45
bank balance shown: 523.80
add deposits: 405.80, 300.50
total: 1230.10
balance: $560.65

Practice Set 8 *pages 100-101*

CHECK NO	DATE	CHECK ISSUED TO	AMOUNT OF CHECK	AMOUNT OF DEPOSIT	BALANCE
			BALANCE BROUGHT FORWARD		60.01
304	7/6	John Cole	12.15		47.86
305	7/7	Frank Life Insurance Co.	20.00		27.86
	7/8	deposit		1033.04	1060.90
306	7/9	Central Gas Co.	25.43		1035.47
307	7/10	O'Hara Co.5	99.52		935.95
308	7/12	First Bank of Boor	882.11		53.84
309	7/13	Klingbiel's	23.79		30.05
	7/17	deposit		32.75	62.80
310	7/17	Cather's Bug Service	37.00		25.80
311	7/18	Horse Magazine	22.97		2.83
	7/20	deposit		1000.00	1002.83
312	7/25	Wendall Stock	100.00		902.83
	7/25	service charge	.90		901.93

outstanding checks: 25.43, 882.11, 22.97, 100.00
total: $1030.51

bank balance: 932.44

deposits: 1000.00

total: 1932.44

balance: $901.93

Practice Set 9 *pages 102-103*

1 a $ .87
b $ .04
c $ .91

2 2.63 or 2.62

3 a 129.75
b 735.25

4 865.69 or 865.68

5

rake	$5.77 or 5.78
fencing	7.50
insecticide	2.87
tools	7.79
subtotal	23.93 or 23.94
sales tax	1.20
total	$25.13 or 25.14

6

pepper bush	$12.78
3 dogwood	50.87
7 bedding plants	9.40
2 pots	12.75
3 pots	14.18
1 pot	8.96
subtotal	108.94
sales tax	6.54
total	$115.48

7

6 spiraea	$16.39
12 trumpet	73.88
48 tulip mix	30.43
5 kits	56.25
subtotal	176.95
sales tax	8.85
total	$185.80

Practice Set 10 *page 104*

1 $141.31
2 $196.69
3 $900.92

Practice Set 11 *page 105*

1 P. Ebersole
2 doz tulips = $7.97
4 doz daffodils = 21.60
2 baskets = 11.54
subtotal = 41.11
sales tax = 2.47
total = $43.58

2 M. Smith
3 mums = $6.30
1 tool set = 6.49
3 doz crocus = 7.90
subtotal = 20.69
sales tax = 1.24
total = $21.93

Practice Set 11 *page 105 (continued)*

3 B. Reith
3 bags fertilizer = $22.45 or 22.46
2 tool sets = 12.98
5 doz daffodils = 27.00
4 doz crocus = 10.53
subtotal = 72.97 or 72.96
sales tax = 3.65
total = $76.62 or 76.61

4 M. Murray
3 baskets = $15.25
2 doz daffodils = 7.97
4 doz daffodils = 21.60
5 mums = 10.50
subtotal = 55.32
sales tax = 2.77
total = $58.09

5 D. Chang
25 ft edging = $83.17 or 83.25
4 yd ribbon = 22.00
7 ft shading cloth = 31.50
subtotal = 136.67 or 136.75
sales tax = 8.20 or 8.21
total = $144.87 or 144.96

Practice Set 12 *page 106*

1 $10.13
2 $326.25
3 *(these may vary)*

gloves	3.43	3.45	3.40
trellis	9.11	9.15	9.10
insecticide	2.00	2.10	2.00
mulch	1.93	1.95	1.90

4 $16.50
5 $7.09
6 $3.00
7 $2.33
8 $17.01
9 $0.61

Practice Set 13 *page 107*

	Cost of Items Purchased by Customers									
	A $9.00 .83 .17 2.50		B $3.25 .20 .20 .20		C $7.89 .89 12.00 6.50		D $7.50 1.02 .75 .79		E $16.50 12.00 .39 2.50	
Subtotal	12.50		3.85		27.28		10.06		31.39	
Sales tax (5%)	.63		.19		1.36		.50		1.57	
Amt. of sale	13.13		4.04		28.64		10.56		32.96	
Money received	$20.00		$5.00		$30.00		$20.00		$50.00	
CHANGE	**No.**	**Total Value**	**No.**	**Total Value**	**No.**	**Total Value**	**No.**	**Total Value**	**No.**	**Total Value**
Pennies	2	.02	1	.01	1	.01	4	.04	4	.04
Nickels							1	.05		
Dimes	1	.10	2	.20	1	.10	1	.10		
Quarters	3	.75	3	.75	1	.25	1	.25		
$1	1	1.00			1	1.00	4	4.00	2	2.00
$5	1	5.00					1	5.00	1	5.00
$10									1	10.00
Total Change		6.87		.96		1.36		9.44		17.04

	F $4.50 .59 2.25		G $16.67 1.79 3.35 .19		H $ 2.25 19.99 5.50		I $ .15 .15 .32 .16		J $ 6.50 17.00 3.00	
Subtotal	7.34		22.00		27.74		.78		26.50	
Sales tax (5%)	.37		1.10		1.39		.04		1.33	
Amt. of sale	7.71		23.10		29.13		.82		27.83	
Money received	$10.00		$50.00		$30.00		$10.00		$40.00	
CHANGE	**No.**	**Total Value**	**No.**	**Total Value**	**No.**	**Total Value**	**No.**	**Total Value**	**No.**	**Total Value**
Pennies	4	.04			2	.02	3	.03	2	.02
Nickels			1	.05			1	.05	1	.05
Dimes			1	.10	1	.10	1	.10	1	.10
Quarters	1	.25	3	.75	3	.75				
$1	2	2.00	1	1.00			4	4.00	2	2.00
$5			1	5.00			1	5.00		
$10			2	20.00					1	10.00
Total Change		2.29		26.90		.87		9.18		12.17

Practice Set 14 *page 108*

	Amount of Sale	Amount Presented	Change Due	CENTS				DOLLARS		
				1	5	10	25	1	5	10
1	$ .59	$ 1.00	.41	1	1	1	1			
2	2.95	5.00	2.05		1			2		
3	3.15	5.15	2.00					2		
4	12.57	20.00	7.43	3	1	1	1	2	1	
5	6.95	10.00	3.05		1			3		
6	3.25	5.00	1.75				3	1		
7	41.54	45.75	4.21	1		2		4		
8	2.09	5.00	2.91	1	1	1	3	2		
9	6.15	7.00	.85			1	3			
10	3.70	10.75	7.05		1			2	1	
11	9.52	10.02	.50				2			
12	29.76	35.00	5.24	4		2			1	
13	21.34	50.00	28.66	1	1	1	2	3	1	2
14	49.27	60.00	10.73	3		2	2			1
15	87.43	90.50	3.07	2	1			3		
16	10.45	20.00	9.55		1		2	4	1	
17	8.17	10.25	2.08	3	1			2		
18	13.90	15.00	1.10			1		1		
19	21.78	25.00	3.22	2		2		3		
20	12.09	20.10	8.01	1				3	1	
21	38.67	40.00	1.33	3	1		1	1		
22	56.49	60.00	3.51	1			2	3		
23	34.32	40.50	6.18	3	1	1		1	1	

Practice Set 15 *page 109*

1 a	.85	**2** a	.34	**3** a	.34
b	3.60	b	5.20	b	.70
c	4.30	c	20.00	c	1.50
d	5.75	d	10.00	d	5.00
e	24.00	e	30.00	e	15.00
f	60.00	f	35.00	f	30.00
g	50.00	g	90.00	g	50.00
h	40.00	h	100.00	h	40.00
i	188.50	i	290.54	i	142.54
j	242.64	j	377.48	j	200.83
k	188.50	k	290.54	k	143.54
checks exactly		checks exactly		shortage $1.00	

Practice Set 16 *page 110*

1 a	447.99	**3** g	2154.36
b	448.32	h	2154.36
c	.33 over	i	OK
2 d	1301.40	**4** j	1139.09
e	1302.45	k	1138.59
f	1.05 over	l	.50 short

CHAPTER 4

Practice Set 1 *pages 136-137*

1 214; deadmen = 37; total = 251
2 7
3 40; deadmen = 8; total = 48
4 11
5 13; deadmen = 4; total = 17
6 18; deadmen = 4; total = 22
7 107; deadmen = 19; total = 126
8 36; deadmen = 7; total = 43
9 14; deadmen = 2; total = 16
10 12; deadmen = 2; total = 14
11 14
12 21; deadmen = 5; total = 26
13 a 56 b 6
c 20 d 3
e 36 f 4
g 30 h 3

Practice Set 2 *pages 138-140*

1 491 bricks
2 600 pavers
3 brick: 69 (.25) = $17.25
block: 7 (1.99) = $13.93
4 484 blocks
5 block: 89
brick: 70
6 968 blocks
7 1164 bricks
8 pavers: 1557
blocks: 252
9 48 blocks
10 150 blocks
11 1955 bricks
12 5922 pavers
13 1643 blocks
14 514 bricks
15 210 blocks
16 16,632 pavers
17 1935 pavers
18 **H**
a 595
b 3673
c 3636
I
d 1055
e 2110
f 2088
J
g 212
h 2160
i 2138

Practice Set 3 *pages 141-142*

1	11.1 cu yd	
2	2 bags	
3	0.9 cu yd	
4	5.2 cu yd	
5	2.2 cu yd	
6	7.3 cu yd	
7	7.1 cu yd	
8	10.7 cu yd	
9	stone: 1.6 cu yd mulch: 1.8 cu yd	
10	a	3.3 cu yd
	b	0.2 cu yd
	c	0.4 cu yd
11	a	8
	b	25
	c	17
	d	37
	e	24

Practice Set 4 *page 143*

1	2.4 cu yd	
2	130.2 cu ft	
3	740,740.7 cu yd	
4	19.1 cu yd	
5	8.6 cu yd	
6	D	885.4 cu ft
	E	54.7 cu ft
	F	12.6 cu ft

Practice Set 5 *pages 144-145*

1 a 5 junipers = 0.8 cu ft = 88 lb
3 dogwoods = 0.9 cu ft = 99 lb
1 magnolia = 1 cu ft = 110 lb
2 maples = 1.6 cu ft = 176 lb
TOTAL = 473 lb

YES, all can be delivered on one truck.

1 b 5 junipers = 1.7 cu ft
3 dogwoods = 2.1 cu ft
1 magnolia = 2.4 cu ft
2 maples = 4.0 cu ft
TOTAL = 10.2 cu ft = 0.4 cu yd

2 7,194 lb

3 4.19 cu ft

4 227 plants

5 0.6 cu yd

6 a 899.8 lb
b 19.4 cu ft

7 mt. ash 0.5 cu ft = 0.02 cu yd
crab 2 cu ft = 0.07 cu yd
euonymus 0.45 cu ft = 0.02 cu yd
TOTAL = 0.11 cu yd

8

Tree or Shrub	Cu ft Soil Needed	Weight of Ball
arborvitae	**a** 0.15 cu ft	**b** 7.7 lb
taxus yew	**c** 0.72 cu ft	**d** 33.0 lb
hemlock	**e** 2.95 cu ft	**f** 324.5 lb
maple	**g** 1.97 cu ft	**h** 216.7 lb
spruce	**i** 3.53 cu ft	**j** 388.3 lb
privet	**k** 0.09 cu ft	**l** 9.9 lb
cotoneaster	**m** 0.36 cu ft	**n** 39.6 lb
azalea	**o** 0.53 cu ft	**p** 58.3 lb
buckeye	**q** 2.43 cu ft	**r** 267.3 lb
willow	**s** 0.96 cu ft	**t** 105.6 lb

Practice Set 6 *page 146*

A posts = 6
length of posts = 7'
collar = 5 8' boards or
3 14' boards
joists = 6 14' boards
floor boards = 32 boards 8' long
rails = 80

B posts = 4
length of posts = 3.5'
collar = 5 8' boards
joists = 6 12' boards
floor boards = 24 boards 8' long

C posts = 4
length of posts = 8.5'
collar = 4 14' boards
joists = 9 14' boards
floor boards = 32 boards 12' long
rails = 48

D posts = 4
length of posts = 9'
collar = 4 16' boards
joists = 9 16' boards
floor boards = 36 boards 12' long
rails = 55 or 56

E posts = 6
length of posts = 7'
collar = 4 16' boards or
8 8' boards
joists = 12 boards:
6 16' boards
6 8' boards
floor boards = 36 boards:
12 16' boards
24 8' boards
rails = 48

F posts = 6
length of posts = 6'
collar = 4 14' boards or
5 12' boards
joists = 12 boards:
9 14' boards
3 3.5' boards
(use 1 12' board)
floor boards = 28 boards:
8 16' boards
20 12' boards
rails = 71 or 72

Practice Set 7 *page 147*

A posts = 4
length of posts = 3.5'
collar = 6 8' boards
joists = 6 14' boards
floor boards = 32 boards 8' long

B posts = 4
length of posts = 4'
collar = 5 12' boards
joists = 9 16' boards
floor boards = 36 boards 12' long

(continued)

Practice Set 7 *page 147 (continued)*

C posts = 4
length of posts = 5'
collar = 7 14' boards
joists = 15 28' long boards
Because boards are 14',
30 boards are needed,
2 for each joist
floor boards = 32 boards 8' long

D posts = 4
length of posts = 8.5'
collar = 8 8' boards
joists = 6 22.75' long boards
One joist uses 3 8' boards;
18 8' boards are needed
floor boards = 52 boards 8' long
rails = 32

E posts = 4
length of posts = 8'
collar = 5 12' boards
joists = 9 14' boards
floor boards = 32 boards 12' long
rails = 52

F posts = 4
length of posts = 7.5'
collar = 6 12' boards
joists = 9 21' boards
one joist uses 2 2' boards;
18 12' boards are needed
floor boards = 48 boards 12' long
rails = 90

G posts = 4
length of posts = 6.5'
collar = 10 8' boards or
5 16' boards

G *(cont.)* joists = 12 joists:
6 21' boards
(3 8' per joist = 18 8' bds)
6 10.5' boards
(2 8' per joist = 12 8' bds) or
(1 16' per joist = 6 16' bds)
floor boards = 48 boards:
24 16' boards
24 8' boards
rails = 90

H posts = 6
length of posts = 6'
collar = 4 16' boards or
5 12' boards or
7 8' boards
joists = 9 boards:
6 16' boards
3 8' boards
floor boards = 32 boards:
16 12' boards
16 8' boards
rails = 82

I posts = 8
length of posts = 5.5'
collar = 8 14' boards or
10 12' boards
joists = 15 boards:
9 28' boards
(2 14' bds per joist = 18 14')
6 21' bds
(2 12' bds per joist = 12 12')
floor boards = 96 12' boards
rails = 210

Practice Set 8 *page 148*

A1 fill = 0.2 cu yd
stone = 143 units
A2 fill = 0.2 cu yd
stone = 120 units
A3 fill = 0.2 cu yd
stone = 240 units

B1 fill = 0.5 cu yd
stone = 84 units
B2 fill = 0.8 cu yd
stone = 167 units
B3 fill = 0.6 cu yd
stone = 100 units

C1 fill = 0.5 cu yd
stone = 200 units
C2 fill = 0.4 cu yd
stone = 100 units
C3 fill = 0.5 cu yd
stone = 120 units

D1 fill = 0.2 cu yd
stone = 40 units

E1 fill = 1.5 cu yd
stone = 477 units
E2 fill = 1.2 cu yd
stone = 400 units
E3 fill = 0.6 cu yd
stone = 800 units

Practice Set 9 *pages 149-150*

A 3 sections and 1 add. post
B 10 sections and 2 add. posts
C 7 sections and 1 add. post
D 13 sections and 2 add. posts
E 15 sections and 1 add. post
F 31 sections and 3 add. posts
G 6 sections and 2 add. posts
H 13 sections and 1 add. post
I 13 sections and 2 add. posts
J 21 sections and 1 add. post
K 24 sections and 2 add. posts
L 31 sections and 3 add. posts

(add. = additional)

Practice Set 10 *pages 151-152*

1 40 sections, 2 add. posts, and 1 gate
2 42 sections and 1 add. post
3 13 sections, 2 add. posts, and 1 gate
4 74 sections and 3 add. posts
5 34 sections and 3 add. posts
6 8 sections and 1 add. post
7 8 sections and 1 add. post
8 10 sections and 2 add. posts
9 54 sections and 2 add. posts
10 37 sections and 1 add. post

Practice Set 11 *pages 153-154*

1 a 9 sections and 1 add. post
b 300 bricks
c 1.8 cu yd

2 a 1326 pavers
b 1.3 cu yd

3 a wall stone = 440 units
b 148 blocks
c fill = 2.2 cu yd

4 a 48 ties and 10 deadmen
b 873 bricks

5 a stone = 246 units
b posts = 6
c collar = 5 12' boards
d joists = 9 boards:
6 18' boards
3 10' boards
e floor = 40 boards:
24 12' boards
16 8' boards
f 128 pavers

CHAPTER 5

Practice Set 1 *pages 172-175*

A	5 lb	I	10.5 lb	Q	3 lb
B	18 lb	J	10 lb	R	9.5 lb
C	2.5 lb	K	10.5 lb	S	9 lb
D	25 lb	L	32 lb	T	6 lb
E	88 lb	M	10 lb	U	23 lb
F	4 lb	N	7 lb	V	7 lb
G	11.5 lb	O	15 lb	W	8.5 lb
H	15 lb	P	15.5 lb	X	4.5 lb

Practice Set 2 *pages 176-177*

1	**2 lb**	**3 lb**	**10 lb**
A-34 Ky. Bluegrass	7.0 oz	10.6 oz	35.2 oz
Parade Ky. Bluegrass	6.1	9.1	30.4
Eclipse Ky. Bluegrass	6.1	9.1	30.4
Ram I Ky. Bluegrass	3.5	5.3	17.6
Adelphi Ky. Bluegrass	1.9	2.9	9.6
Pennfine Peren. Ryegrass	5.8	8.6	28.8
crop seed	0.6	1.0	3.2
inert matter	0.6	1.0	3.2
weeds	0.3	0.5	1.6

2	**1.5 lb**	**5 lb**	**10 lb**
Creeping Red Fescue	6.7 oz	22.4 oz	44.8 oz
Baron Ky. Bluegrass	4.1	13.6	27.2
Shad. Chewings Fescue	2.6	8.8	17.6
A-34 Ky. Bluegrass	2.4	8.0	16.0
Aurora Hard Fescue	1.4	4.8	9.6
Om. Peren. Ryegrass	3.4	11.2	22.4
Annual Ryegrass	2.4	8.0	16.0
crop seed	0.2	0.8	1.6
inert matter	0.5	1.6	3.2
weeds	0.2	0.8	1.6

(continued)

Practice Set 2 *pages 176-177 (continued)*

3	10 lb	20 lb	50 lb
Creeping Red Fescue	48.0 oz	96.0 oz	240.0 oz
Chewings Fescue	28.8	57.6	144.0
Shad. Chewings Fescue	27.2	54.4	136.0
Nustar Ky. Bluegrass	17.6	35.2	88.0
Glade Ky. Bluegrass	16.0	32.0	80.0
Aurora Hard Fescue	14.4	28.8	72.0
crop seed	1.6	3.2	8.0
inert matter	4.8	9.6	24.0
weeds	1.6	3.2	8.0

4	5 lb	25 lb	40 lb
Creeping Red Fescue	26.4 oz	132.0 oz	211.2 oz
Baron Ky. Bluegrass	12.0	60.0	96.0
Parade Ky. Bluegrass	11.2	56.0	89.6
Prelude Peren. Ryegrass	10.4	52.0	83.2
Pennfine Peren. Ryegrass	9.6	48.0	76.8
Om. Peren. Ryegrass	7.6	38.0	60.8
crop seed	0.8	4.0	6.4
inert matter	1.6	8.0	12.8
weeds	0.4	2.0	3.2

5	3 lb	10 lb	25 lb
Annual Ryegrass	19.2 oz	64.0 oz	160.0 oz
Chewings Fescue	8.6	28.8	72.0
Creeping Red Fescue	8.2	27.2	68.0
A-34 Ky. Bluegrass	9.1	30.4	76.0
inert matter	2.9	9.6	24.0

6	10 lb	20 lb	45 lb
Annual Ryegrass	36.8 oz	73.6 oz	165.6 oz
Creeping Red Fescue	11.2	22.4	50.4
Aurora Hard Fescue	8.0	16.0	36.0
A-34 Ky. Bluegrass	54.4	108.8	244.8
Ram I Ky. Bluegrass	38.4	76.8	172.8
inert matter	11.2	22.4	50.4

(continued)

Practice Set 2 *pages 176-177 (continued)*

7	15 lb	35 lb	60 lb
Creeping Red Fescue	84.0 oz	196.0 oz	336.0 oz
Annual Ryegrass	60.0	140.0	240.0
Penn. Peren. Ryegrass	24.0	56.0	96.0
Om. Peren. Ryegrass	48.0	112.0	192.0
Aurora Hard Fescue	12.0	28.0	48.0
inert matter	4.8	11.2	19.2
weeds	7.2	16.8	28.8

8	18 lb	32 lb	45 lb
A-34 Ky. Bluegrass	109.4 oz	194.6 oz	273.6 oz
Parade Ky. Bluegrass	83.5	148.5	208.8
Prel. Peren. Ryegrass	66.2	117.8	165.6
Creeping Red Fescue	23.0	41.0	57.6
weeds	5.8	10.2	14.4

Practice Set 3 *pages 178-179*

1	3 lb	15 lb	25 lb	45 lb
Omega II Perennial Ryegrass	$1.43	$7.18	$8.28	$14.90
Creeping Red Fescue	1.01	4.37	6.72	12.10
Aurora Hard Fescue	0.62	2.88	4.40	7.92
Eclipse Kentucky Bluegrass	6.85	28.56	42.16	75.89
Ram I Kentucky Bluegrass	4.72	19.58	28.80	51.84
TOTAL PRICE	14.63	62.57	90.36	162.65

2	6 lb	12 lb	18 lb	30 lb
Omega II Perennial Ryegrass	$4.99	$9.98	$14.98	$17.28
Chewings Fescue	2.76	5.18	7.78	11.23
Creeping Red Fescue	3.17	5.49	8.24	12.67
Eclipse Kentucky Bluegrass	8.06	13.44	20.16	29.76
TOTAL PRICE	18.98	34.09	51.16	70.94

(continued)

Practice Set 3 *pages 178-179* *(continued)*

3	12 lb	20 lb	35 lb
Omega II Perennial Ryegrass	$7.99	$9.22	$16.13
Chewings Fescue	5.18	7.49	13.10
Aurora Hard Fescue	6.91	10.56	18.48
Creeping Red Fescue	4.99	7.68	13.44
Ram I Kentucky Bluegrass	9.79	14.40	25.20
TOTAL PRICE	34.86	49.35	86.35

4	4 lb	8 lb	12 lb	22 lb
Omega II Perennial Ryegrass	$4.99	$9.98	$14.98	$19.01
Chewings Fescue	1.23	2.46	3.46	5.49
Creeping Red Fescue	1.64	3.27	4.24	7.18
Eclipse Kentucky Bluegrass	2.96	5.91	7.39	12.00
TOTAL PRICE	10.82	21.62	30.07	43.68

5	5 lb	13 lb	17 lb	24 lb
Ram I Kentucky Bluegrass	$13.12	$28.29	$36.99	$46.08
Eclipse Kentucky Bluegrass	6.72	14.56	19.04	23.81
Chewings Fescue	1.92	4.68	6.12	7.49
Creeping Red Fescue	2.04	4.60	6.01	7.84
Omega II Perennial Ryegrass	0.83	2.16	2.83	2.76
TOTAL PRICE	24.63	54.29	70.99	87.98

6	8 lb	15 lb	28 lb	40 lb
Omega II Perennial Ryegrass	$6.66	$12.48	$16.13	$23.04
Chewings Fescue	3.69	6.48	10.48	14.98
Creeping Red Fescue	4.80	7.80	13.44	19.20
Eclipse Kentucky Bluegrass	9.14	14.28	23.61	33.73
TOTAL PRICE	24.29	41.04	63.66	90.95

Practice Set 4 *pages 180-181*

1	417 yd
2	389 yd
3	673 yd
4	32 yd
5	2500 yd
6	15 yd
7	164 yd
8	290 yd

Practice Set 5 *pages 182-183*

A	30 yd	**F**	88 yd
B	58 yd	**G**	45 yd
C	134 yd	**H**	129 yd
D	319 yd	**I**	160 yd
E	606 yd	**J**	174 yd

Practice Set 6 *pages 184-185* **Part A**

1	a	2 cups	**4**	a	8 oz
	b	1 qt		b	8 oz
	c	15 T		c	4 oz
	d	2 qt		d	1 T
2	a	1 gallon	**5**	a	6 t or .96 oz
	b	1 gallon		b	1 1/2 c or 12.8 oz
	c	1 quart		c	4 gallons
	d	2 gallons		d	4 t or .64 oz
3	a	1/4 pint			
	b	1/4 pint			
	c	1 quart			
	d	1 quart			

Practice Set 6 *pages 184-185*

1 18 qt
2 15 qt
3 23.5 qt
4 18.5 qt
5 77.5 qt
6 3 qt
7 6.5 qt

Part B

8 15.25 qt
9 23.25 qt
10 37 qt
11 52.5 qt
12 29.5 qt
13 18 qt

Practice Set 7 *pages 186-187*

1 10 quarts
2 19 pints
3 17 quarts
4 5 gallons
5 1.5 quarts or 1 qt 16 oz
6 2.2 quarts or 2 qt 6 oz
7 1.08 quarts or 1 qt 3 oz
8 diesel oil = 3 quarts 1 ounce
water = 7 quarts 19 ounces
9 chemical = 1 quart 19 ounces
oil = 3 quarts 6 ounces
water = 11 quarts 6 ounces
10 chemical = 19 ounces
oil = 1 quart
water = 3 quarts 23 ounces
11 chemical = 11 ounces
oil = 6 ounces
water = 4 quarts 22 ounces
12 chemical = 3 pints 12 ounces
oil = 5 pints 1 ounce
water = 21 pints 7 ounces

Practice Set 8 *page 188*

1 11 lb
2 25 lb
3 N 6.4 lb
P 3.8 lb
K 2.6 lb

4 104 lb
5 9 lb
6 16 lb
7 25 lb

8 12.5 lb
9 1.9 lb
10 31.4 lb
11 0.5 lb

Practice Set 9 *pages 189-191*

1 a 4.5 lb
b 19 lb
c 14 lb
d 8.5 lb
e 27.5 lb

2

nitrogen	potassium	phosphorus	filler
5 lb	2 lb	3 lb	40 lb
4.8 lb	3 lb	3.6 lb	18.6 lb
22.5 lb	9 lb	9 lb	34.5 lb
25.2 lb	10.8 lb	14.4 lb	39.6 lb
19 lb	12 lb	16 lb	53 lb
25 lb	12.5 lb	18.8 lb	68.7 lb

3 7.8 lb
4 33.5 lb
5 5.4 lb
6 3 lb
7 11.75 lb
8 2 bags

9 A 3 bags
10 B 6 bags
C 4 bags
D 3 bags
E 4 bags
F 3 bags
G 6 bags

CHAPTER 6

Practice Set 1 *pages 198-199*

1	a	scale: 1" = 8'	line drawn is 2.25 in.
	b	scale: 1" = 4'	line drawn is 5 in.
	c	scale: 1" = 2'	line drawn is 3 in.
	d	scale: 3" = 16'	line drawn is 2.8 in.
	e	scale: 3" = 8'	line drawn is 4.5 in.
	f	scale: 3" = 16'	line drawn is 1.5 in.
	g	scale: 1" = 4'	line drawn is 2.5 in.
	h	scale: 1" = 8'	line drawn is 3.75 in.
	i	scale: 1" = 2'	line drawn is 4 in.
	j	scale: 3" = 16'	line drawn is 2.25 in.

2	a	36'
	b	6.75'
	c	13.5'
	d	10'
	e	18'

3	a	5'
	b	7'
	c	7'
	d	14'

4	a	5'	f	8'
	b	1'	g	6'
	c	3'	h	11'
	d	5'	i	12'
	e	4.25'	j	4'

5 line to be drawn is 3.375 in.

6	a	1 inch on the drawing equals 8 feet in the landscape
	b	1 inch on the drawing equals 4 feet in the landscape
	c	1 inch on the drawing equals 16 feet in the landscape
	d	1 inch on the drawing equals 2 feet in the landscape
	e	3 inches on the drawing equals 32 feet in the landscape

7	a	3.5"	f	2.75"
	b	2.25"	g	10.25"
	c	1.5"	h	1.75"
	d	6"	i	.875"
	e	1.25"	j	3.25"

Practice Set 2 *pages 200-201*

1 - A & B				2 - C & D		3 - E & F	
a	5'	g	4.5'	a	19.5'	a	16'
b	10'	h	6'	b	27'	b	49'
c	8'	i	3.5'	c	18'	c	24'
d	6'	j	4'	d	12'	d	23'
e	3'	k	8'	e	16'	e	16'
f	4'	l	10'	f	20'	f	10'
						g	16'
						h	10'

Practice Set 5 - PLAN 1 *pages 204-205*

		actual	rounded
fertilizer	16 lb @ 25 lb/$12.95	$ 8.29	$ 8.30
mulch	6 cu yd @ $20.00/cu yd	120.00	120.00
subtotal		128.29	128.30
sales tax		7.70	7.70
labor	3.5 hr @ $18/hr	63.00	63.00
TOTAL		198.99	199.00

Practice Set 6 - PLAN 2 *pages 206-207*

		actual	rounded
grass seed	43 lb @ 10 lb/$21	$ 90.30	$ 90.00
fertilizer	53.5 lb @ 25 lb/$12.95	27.71	28.00
mulch	8 cu yd @ $22.50/cu yd	180.00	180.00
subtotal		298.01	298.00
sales tax		14.90	14.90
labor	2.5 hr @ $18/hr	45.00	45.00
TOTAL		357.91	357.90

Practice Set 7 - PLAN 3 *pages 208-209*

		actual	rounded
fence	23 sections @ $23	$ 529.00	$ 529.00
	1 post @ $10.29	10.29	10.00
shrubs	90 plants @ $13.95	1255.50	1256.00
mulch	5.5 cu yd @ $25/cu yd	137.50	138.00
sod	1165 yd @ $2.50/cu yd	2912.50	2913.00
patio	1030 14" square blocks @ $1.79	1843.70	1844.00
subtotal		6688.49	6690.00
sales tax		401.31	401.31
labor		5016.37	5016.00
TOTAL		12,106.17	12,107.31

Practice Set 8 - PLAN 4 *pages 210-211*

		actual	rounded
concrete pavers	2403.5 sq ft @ $2.99	$ 7186.47	$ 7186.00
mulch	6 cu yd @ $19	114.00	114.00
shrubs	106 plants @ $12.95	1372.70	1373.00
grass seed	34 lb @ 10 lb/$25	85.00	85.00
fertilizer	27 lb @ 20 lb/$27.95	37.73	38.00
fence	31 sections @ $27	837.00	837.00
	2 posts @ $8.99	17.98	18.00
	1 gate @ $49.99	49.99	50.00
removal of sod & topsoil	22 cu yd @ $15	330.00	330.00
crushed limestone	22 cu yd @ $24	528.00	528.00
subtotal		10558.87	10560.00
sales tax		527.94	528.00
labor		10558.87	10560.00
TOTAL		21645.68	21648.00

Practice Set 9 - PLAN 5 *pages 212-213*

		actual	rounded
deck materials	6 - 8' posts @ $6.09	$ 36.54	$ 37.00
	22 - 14' boards @ $12.75	280.50	281.00
	20 - 12' boards @ $11.99	239.80	240.00
	63 rails @ $.99	62.37	62.00
annuals	3 flats @ $12.99	38.97	39.00
grass seed	2 lb @ 5 lb/$15	6.00	6.00
shrubs	10 plants @ $18.99	189.90	190.00
perennials	5 doz @ $16	80.00	80.00
mulch	3 cu yd @ $25	75.00	75.00
fence	8 sections @ $28.95	231.60	232.00
	1 post @ $6.09	6.09	6.00
subtotal		1246.77	1248.00
sales tax		74.81	75.00
labor		1246.77	1248.00
TOTAL		2568.35	2571.00

Practice Set 10 - PLAN 6 *pages 214-215*

		actual	rounded
fence	79 sections @ $21.75	$ 1718.25	$ 1718.00
	3 posts @ $5.98	17.94	18.00
	1 walk gate @ $79	79.00	79.00
	1 driveway gate @ $149	149.00	149.00
removal of sod & topsoil	27 cu yd @ $14	378.00	378.00
sand	27 cu yd @ $24	648.00	648.00
brick	10870 @ $.25	2717.50	2718.00
subtotal		5707.69	5708.00
sales tax		342.46	342.00
labor		5707.69	5708.00
TOTAL		11,757.84	11,758.00

Practice Set 11 - PLAN 7 *pages 216-218*

BID 1

		actual	rounded
fence	57 sections @ $21.75	$ 1239.75	$ 1240.00
	1 post @ $5.98	5.98	6.00
shrubs	4 bundles @ $25	100.00	100.00
brick	1023 cream @ $.33	337.59	338.00
	1023 red @ $.38	388.74	389.00
fertilizer	104 lb @ 25 lb/$12.95	53.87	54.00
crushed limestone	7 cu yd @ $24	168.00	168.00
plastic edging	104 ft @ $2	208.00	208.00
subtotal		2501.93	2503.00
sales tax		150.12	150.00
labor		1876.45	1877.00
TOTAL		4528.50	4530.00

Practice Set 11 - PLAN 7 *pages 216-218*

BID 2

		actual	rounded
fence	37 sections @ $21.75	$ 804.75	$ 805.00
	1 post @ $5.98	5.98	6.00
	1 gate @ $79.00	79.00	79.00
shrubs	15 bundles @ $25	375.00	375.00
brick	1023 cream @ $.33	337.59	338.00
	1023 red @ $.38	388.74	389.00
fertilizer	104 lb @ 25 lb/$12.95	53.87	54.00
crushed limestone	7 cu yd @ $24	168.00	168.00
plastic edging	104 ft @ $2	208.00	208.00
subtotal		2420.93	2422.00
sales tax		145.26	145.00
labor		1815.70	1817.00
TOTAL		4381.89	4384.00

CHAPTER 7

Practice Set 1 *page 234*

Plant	Seeds per Oz	Number Purchased	Cost per Seed
SEEDS			
ageratum	200,000	6,250	$ .01
alyssum	85,000	21,250	.01
aster	12,000	3,000	.01
celosia - CF	36,000	4,500	.01
celosia - JB	36,000	2,250	.01
coleus	100,000	6,250	.01
dusty miller	90,000	5,625	.01
geranium - salmon		800	.09
geranium - white		800	.08
geranium - red		3,500	.08
impatiens red	40,000-90,000	5,000-11,250	.03 -.01
marigold - bolero	9,000-10,000	4,500-5,000	.01
marigold - yellow	9,000-10,000	2,250-2,500	.02 -.01
petunia - white	275,000	2148	.01
petunia - red	275,000	2148	.01
petunia - mix	275,000	4,297	.01
salvia	7,500	3,750	.01
snapdragon	180,000	1,406	.01
vinca	21,000	5,250	.01
broccoli	9,000	4,500	.01
cabbage	7,000	7,000	.01
onion	8,500-9,000	8,500-9,000	.01
pepper	4,000-4,500	4,000-4,500	.02 -.01
tomato - BB	7,000-10,000	3,500-5,000	.01
tomato - beefm.	7,000-10,000	875-1250	.01
FLATS			
fuchsia - pink		288	.27
fuchsia - red		384	.27
begonia		174	.42
vinca vine		288	.48
dracena spikes		276	.30
ivy geranium - white		144	.72
ivy geranium - pink		144	.72

Practice Set 2 *page 234*

Answers may vary according to seed catalog used.

December	
week 1	
week 2	
week 3	
week 4	geranium
January	
week 1	fuchsia, begonia, ivy geranium
week 2	
week 3	alyssum, dusty miller, snapdragon, vinca
week 4	
February	
week 1	
week 2	ageratum, petunia
week 3	impatiens, marigold, salvia
week 4	coleus
March	
week 1	aster, celosia, pepper
week 2	
week 3	broccoli, cabbage, onion
week 4	tomato
April	
week 1	
week 2	
week 3	
week 4	

Practice Set 3 *page 234*

cell packs	@ $.02
10" baskets	@ $.74
4" square pots	@ $.06

Practice Set 4 *page 235*

1	376 pots
2	$ .78
3	38 pots
4	$ .13
5	$ .05
6	$ .37

Practice Set 5
page 236

1 $ .08
2 $ .01

Practice Set 6
page 236

1 $ .01
2 $ .02

Practice Set 7 *page 237*

number of weeks	overhead per plant
14	$.08
11	.06
10	.06
9	.05
8	.05
6	.04
5	.03

Practice Set 8A *page 238*

Cost Factors	Begonia Basket	Ivy Geranium Basket
cuttings	4 x .42	4 x .72
basket	.74	.74
soil	.56	.56
fertilizer	4 x .01	4 x .01
Compactall	0	0
overhead	4 x .09	4 x .09
TOTAL COST	3.38	4.58

Practice Set 8B *pages 238-239*

	16-WEEK		
Cost Factors	Geranium-white	Geranium-red	Geranium-salmon
seed, cutting	.08	.08	.09
4" pot	.06	.06	.06
soil	.08	.08	.08
fertilizer	.01	.01	.01
Compactall	.01	.01	.01
overhead	.09	.09	.09
TOTAL COST	.33	.33	.34

Practice Set 8B *pages 238-239 (continued)*

	14-WEEK			
Cost Factors	**Alyssum**	**Dusty Miller**	**Snapdragon**	**Vinca**
seed, cutting	4 x .01	4 x .01	4 x .01	4 x .01
cell pack	.02	.02	.02	.02
soil	.04	.04	.04	.04
fertilizer	4 x .01	4 x .01	4 x .01	4 x .01
Compactall	0	0	0	0
overhead	4 x .08	4 x .08	4 x .08	4 x .08
TOTAL COST	.46	.46	.46	.46

	11-WEEK		9-WEEK
Cost Factors	**Ageratum**	**Petunia**	**Coleus**
seed, cutting	4 x .01	4 x .01	4 x .01
cell pack	.02	.02	.02
soil	.04	.04	.04
fertilizer	4 x .01	4 x .01	4 x .01
Compactall	0	0	0
overhead	4 x .06	4 x .06	4 x .05
TOTAL COST	.38	.38	.34

	10-WEEK				
Cost Factors	**Impatiens**		**Marigold**		**Salvia**
seed, cutting	4 x .01	4 x .03	4 x .01	4 x .02	4 x .01
cell pack	.02	.02	.02	.02	.02
soil	.04	.04	.04	.04	.04
fertilizer	4 x .01	4 x .01	4 x .01	4 x .01	4 x .01
Compactall	0	0	0	0	0
overhead	4 x .06	4 x .06	4 x .06	4 x .06	4 x .06
TOTAL COST	.38	.46	.38	.42	.38

Practice Set 8B *pages 238-239 (continued)*

	8-WEEK			
Cost Factors	**Aster**	**Celosia**	**Pepper**	**Pepper**
seed, cutting	4 x .01	4 x .01	4 x .01	4 x .02
cell pack	.02	.02	.02	.02
soil	.04	.04	.04	.04
fertilizer	4 x .01	4 x .01	4 x .01	4 x .01
Compactall	0	0	0	0
overhead	4 x .05	4 x .05	4 x .05	4 x .05
TOTAL COST	.34	.34	.34	.38

	6-WEEK		
Cost Factors	**Broccoli**	**Cabbage**	**Onion**
seed, cutting	4 x .01	4 x .01	4 x .01
cell pack	.02	.02	.02
soil	.04	.04	.04
fertilizer	4 x .01	4 x .01	4 x .01
Compactall	0	0	0
overhead	4 x .04	4 x .04	4 x .04
TOTAL COST	.30	.30	.30

	5-WEEK
Cost Factors	**Tomato**
seed, cutting	4 x .01
cell pack	.02
soil	.04
fertilizer	4 x .01
Compactall	0
overhead	4 x .04
TOTAL COST	.30

Practice Set 9A *page 240*

If Total Cost of Production Is:	Mark-up Rates						
	30%	2:1	40%	3:1	45%	4:1	60%
.30	.39	.60	.42	.90	.44	1.20	.48
.33	.43	.66	.46	.99	.48	1.32	.53
.34	.44	.68	.48	1.02	.49	1.36	.54
.38	.49	.76	.53	1.14	.55	1.52	.61
.40	.52	.80	.56	1.20	.58	1.60	.64
.46	.60	.92	.64	1.38	.67	1.84	.74

Practice Set 9B *page 240*

Hanging Basket	Total Cost of Production	Mark-up Rates				
		40%	2:1	65%	3.5:1	75%
Ivy geranium	4.58	6.41	9.16	7.56	16.03	8.02
Begonia	3.38	4.73	6.76	5.58	11.83	5.92
Fuchsia	2.78	3.89	5.56	4.59	9.73	4.87

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